Royal Commission
on Canada's Economic Prospects

# Transportation in Canada



by J.-C. Lessard

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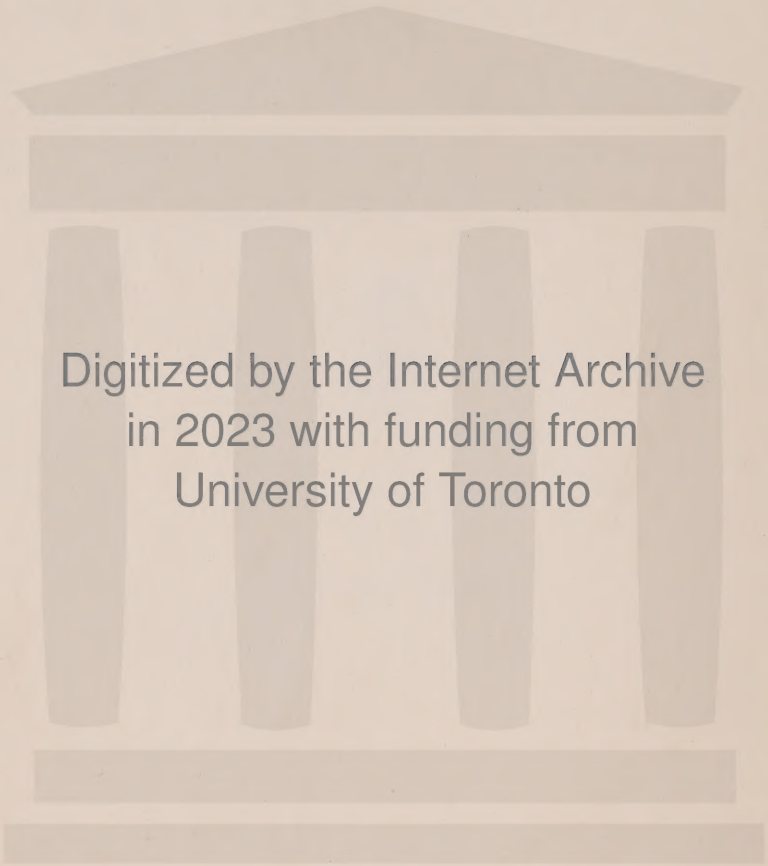

ROYAL COMMISSION ON CANADA'S ECONOMIC PROSPECTS

# TRANSPORTATION IN CANADA

by J-C. LESSARD

NOVEMBER, 1956

*While authorizing the publication of this study, which has been prepared at their request, the Commissioners do not necessarily accept responsibility for all the statements or opinions that may be found in it.*

# FOREWORD

The terms of reference of this study were enclosed in a letter to the undersigned from the Chairman, Mr. W. L. Gordon, dated August 15, 1955 and were as follows:

1. An estimate of the direct and indirect cost of transportation in Canada, with some indication of probable future trends. Naturally this study should cover all modes of transportation.
2. Transportation costs as a percentage of the gross national product. This will assess the relationship of transportation costs to the gross national product in the past, and attempt to estimate the corresponding relationship in the future.
3. Competitive elements in the transportation field. This will deal with the various forms of competing transportation services.
4. An appraisal of future developments in the transportation field. This will include some assessment of new facilities which may be constructed, new services to be established, technological improvements, etc.
5. Incidence of transportation costs and overhead costs. This will be based upon studies of such costs in connection with certain selected commodities for a group of representative Canadian cities.

Paragraph 5 above was subsequently eliminated after it was found that time would not permit to assess the factors involved, together with the necessary computation of basic information in a country-wide analysis.

Considerable assistance was received from the major transportation organizations and from numerous departments of the Federal Government, particularly the Department of Transport and the Dominion Bureau of Statistics.

Directly assisting in the preparation of the study were Mr. W. G. Scott, General Secretary of the Railway Association of Canada, Montreal; Mr. Arthur F. Hailey of Trailmobile Canada Ltd., Toronto; Mr. J. D. Howe, Economist, Canadian National Railways, Montreal, and Mr. W. M. Sprung of the Department of Transport, Ottawa.

Respectfully submitted,

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Montreal, Que.
July 3, 1956

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## INTRODUCTION

THE general purpose of this statistical analysis is considered to be threefold:

1. to bring under one head the estimated total cost of transportation in Canada, both direct and indirect,
2. to analyse the costs of each method of transportation and its relative importance to the total Canadian transportation picture, and
3. to attempt to forecast the behaviour of these costs in the next 25 years.

The magnitude itself of the basis information to be collected limited the detailed analysis to five selected years, that is 1928, 1936, 1945, 1949 and 1953. The year 1928 was chosen as representing the peak of activity in the '20's, 1936 as a normal low year in the '30's, 1945 as the last year of the war, 1949 as a postwar year unaffected by the Korean War, and 1953 as the last year for which complete statistical data are available.

Five basic tables have been prepared showing separately for each mode of transportation the direct and indirect costs in each of the years selected. These five modes of transportation are:

| | |
|---|---|
| Air | Schedule 1 |
| Highway | " 2 |
| Pipeline | " 3 |
| Rail | " 4 |
| Water | " 5 |

Direct cost of transportation, generally speaking, is the amount of money spent by users for the purchase of transportation from either a common or contract carrier, or from the operation of privately owned vehicles.

Indirect cost of transportation, on the other hand, is the sum of money made available by all levels of government to the transportation industry through direct subsidy, the provision and operation of facilities and the payments of deficits. It would have been impossible to determine all the assistance given by governments since there are considerable shortcomings in readily available statistical information. Furthermore, such assistance as tax exemptions could not be established without minute research for which time was not available.

The ideal pattern to follow in the preparation of this analysis would be as indicated below:

(a) to determine direct costs of each mode of transportation from the revenues received from the users and eliminate therefrom any revenue collected by the transportation agency on behalf of a government in the form of tax collection for that government.

(b) to determine indirect costs of each mode of transportation from the accounts of all governments by selecting the expenses incurred for subsidy payments, operation and maintenance of facilities and cash deficits, as well as annual costs of capital expenditures made for transportation purposes. In determining the annual capital costs, it is assumed that the capital expenditures should be amortized over a period of years and that interest should be charged on the unamortized portions. From these costs would be deducted the revenue received by the governments from the users of the facilities provided.

Had it been possible to follow the formula described above the result of the analysis would have been as accurate as could be determined by all available facts. Unfortunately, it was soon discovered that the ideal formula could not be followed, particularly insofar as historical facts were concerned. For example, it is only in recent years that the federal government has made an attempt to segregate annually capital expenditures from current expenditures, so that it proved impossible to determine accurately the annual cost in any of our selected years. The same situation prevailed for highway expenditures. Nowhere could be found complete records of past expenditures by municipalities, counties and provincial governments for streets, roads and highways. It was also impossible to find revenue figures for all highway transportation, and recourse had to be made to estimating annual costs of operation of passenger cars and trucks.

The formula which was adopted to determine indirect costs of transportation is based on annual capital expenditures plus operation, maintenance, subsidies and deficits. All types of transportation could be analyzed in the manner described and such a basis was chosen in order that uniformity might be achieved in the detailed analysis of each type of transportation.

Also time was not available, nor is it believed to be possible, to eliminate altogether certain duplications in the data such as, for example, revenue from the transportation of materials entering into the cost of airport construction, highway construction, etc., and the same amounts which are included in either the capital expenditures or maintenance expenses by the government agencies providing these facilities. The same situation is apparent in many items and no formula could be followed which could have produced a statement of direct and indirect costs in which one could feel

reasonably certain that all duplications had been eliminated. Therefore the real value of the statements which have been developed is to compare the relative expenditures by individuals and by the various levels of government on each type of transportation. For example, a logical conclusion to be derived from an analysis of the schedules attached to this report would be that individuals in 1953 spent 3.5 times more on highway transportation than on all other modes of transportation put together. However, it would be inaccurate to translate these expenditures as a percentage of the Gross National Product for the reasons enumerated above.

It will therefore be realized that the following analysis has certain shortcomings and cannot be considered as perfectly accurate in all respects. However, such an elaborate study has never before been attempted in Canada and while it is subject to certain reservations, it is hoped that it will throw light upon a subject which has always been, and will ever be, most important to the Canadian economy, i.e. the complex problem of the transportation of persons and goods.

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## AIR TRANSPORTATION

THE movement of passengers and goods by air is a relatively new development in the transportation industry in Canada. Commercial air operations began on a large scale in Canada a little over ten years ago. Trans-Canada Airlines was actually organized just before World War II, but the full growth of air transportation on a commercial basis is a postwar development, dating from the time when trained personnel, facilities and aircraft became available. It was also in the immediate postwar period that overseas air services were placed in operation. Such important organizations as the International Civil Aviation Organization, the International Air Transport Association, and the Canadian Air Transport Board began to function in this period.

### *Direct Cost of Air Transportation*

There are two indicated sources of direct air transportation costs; revenues of commercial air carriers, and the cost of operation of privately owned aircraft (i.e. all aicraft owned by individuals or by companies, and operated for their own use). The Air Transport Board, from the very beginning, has required financial and statistical reports from the commercial air operators licensed by the Board; reports were compiled for the years 1928 and 1936 by the Department of National Defence, but are somewhat incomplete.

Total revenues earned by commercial operators have increased more than 60 times between the years 1928 and 1953, or from $1,680,000 to $101,022,000. This information appears in detail in Schedule I. This growth has taken place mostly since 1945, with revenues increasing from a level of $16,400,000 to over $101,000,000, or more than six times. It should be mentioned that these revenue figures cover the total operations of scheduled and non-scheduled operators reporting to the Air Transport Board. In other words no distinction is drawn between domestic and international services other than to include only Canadian-owned carriers. It is considered that the revenues earned by Canadian companies in the international services would represent a direct cost of transportation. This cost would not be inflated, as other international operators are licensed to solicit traffic in Canada, and revenue statements from these operators are not available and are not included in this study.

Miscellaneous revenues are made up of a variety of non-transport operations performed by commercial operators which cannot be allocated to passenger, freight or mail categories. Included in these operations are flying clubs, forest and fire patrols, crop-dusting, aerial photography, etc.

The following table showing passengers, tons of freight and mail carried gives a clear indication of the increasing traffic being moved by air.

## CANADIAN AIR CARRIERS—DOMESTIC AND INTERNATIONAL

*(1945-1954)*

| Year | Passengers | | Freight(1) | | Mail | |
|---|---|---|---|---|---|---|
| | Scheduled carriers | Non-sched. carriers | Scheduled carriers | Non-sched. carriers | Scheduled carriers | Non-sched. carriers |
| | No. | No. | Tons | Tons | Tons | Tons |
| 1945 | 347,149 | 18,716 | 5,461 | 582 | 2,557 | 41 |
| 1946 | 547,127 | 63,416 | 9,276 | 2,054 | 2,406 | 52 |
| 1947 | 597,917 | 111,458 | 8,026 | 7,217 | 2,961 | 69 |
| 1948 | 749,627 | 163,601 | 8,532 | 7,816 | 4,466 | 96 |
| 1949 | 878,980 | 155,599 | 8,330 | 7,616 | 6,008 | 186 |
| 1950 | 1,115,439 | 155,053 | 11,453 | 8,948 | 6,506 | 181 |
| 1951 | 1,373,204 | 182,153 | 14,648 | 11,297 | 6,893 | 247 |
| 1952 | 1,632,532 | 264,473 | 20,460 | 43,185 | 7,387 | 274 |
| 1953 | 1,861,953 | 349,784 | 23,365 | 60,814 | 8,166 | 377 |
| 1954 | 1,986,755 | 329,910 | 22,817 | 28,770 | 10,667 | 414 |

Source: Dominion Bureau of Statistics, Civil Aviation Annual Reports.

(1) Includes Express and Excess baggage.

For the same years it is interesting to note the comparison between air freight ton-miles, mail ton-miles and passenger-miles.

## CANADIAN AIR CARRIERS—DOMESTIC AND INTERNATIONAL

*(1945-1954)*

| Year | Passenger miles | Freight ton-miles | Mail ton-miles |
|---|---|---|---|
| 1945 | 131,778,956 | 1,235,573 | 1,791,250 |
| 1946 | 193,685,397 | 1,844,293 | 1,485,824 |
| 1947 | 273,763,105 | 3,414,293 | 1,832,114 |
| 1948 | 408,499,583 | 4,890,933 | 3,029,841 |
| 1949 | 473,157,118 | 5,799,346 | 4,258,250 |
| 1950 | 557,331,598 | 7,541,408 | 4,560,968 |
| 1951 | 709,760,655 | 9,121,909 | 5,024,232 |
| 1952 | 765,354,996 | 9,272,667 | 5,558,662 |
| 1953 | 895,597,913 | 10,728,780 | 6,307,456 |
| 1954 | 1,023,134,596 | 13,613,541 | 8,138,079 |

Source: Dominion Bureau of Statistics, Civil Aviation Annual Reports.

One comment might be made with respect to airmail. In 1945 the revenues derived from the carriage of mail amounted to approximately one-third of the total revenue received, while eight years later it only amounted to one-tenth, and this with 82% increase in mail revenue collected. This is an interesting aspect of the Canadian situation. In the United States the position is quite similar, as shown in the following table:

## UNITED STATES DOMESTIC SCHEDULED AIR CARRIERS OPERATING REVENUES

*(1940-1953)*

| Year | Total operating revenues | Mail revenues | Percentage of total |
|---|---|---|---|
| | $ | $ | % |
| 1940 | 76,863,643 | 20,090,123 | 26.1 |
| 1941 | 97,311,134 | 22,696,351 | 23.3 |
| 1942 | 108,248,830 | 23,470,088 | 21.7 |
| 1943 | 123,104,965 | 24,212,580 | 19.7 |
| 1944 | 160,928,192 | 33,317,366 | 20.7 |
| 1945 | 214,743,090 | 33,693,467 | 15.7 |
| 1946 | 316,232,793 | 20,981,542 | 6.6 |
| 1947 | 364,839,575 | 29,444,746 | 8.1 |
| 1948 | 434,295,383 | 59,309,343 | 13.7 |
| 1949 | 486,033,845 | 59,332,992 | 12.2 |
| 1950 | 557,802,577 | 63,788,090 | 11.4 |
| 1951 | 702,364,506 | 57,421,687 | 8.2 |
| 1952 | 817,680,000 | 58,887,000 | 7.2 |
| 1953 | 937,482,000 | 64,484,000 | 6.9 |

Source: Bureau of Air Operations, C.A.B.

Thus the mail revenues in the United States amounted to nearly 16% of the total in 1945 and 7% in 1953, while the mail revenues considered separately increased by 91% during the same period.

Air passenger traffic has been a great deal more important to date than air cargo (which includes both air freight and air express). However, air freight has increased considerably in volume since 1945 and in certain areas forms the major portion of air traffic. Mining and industrial developments in outlying areas are more and more dependent on aircraft for the transportation of equipment and supplies and, in fact, certain major developments during the past few years would have been impossible or retarded for some time without the facilities offered by air lift. The Knob Lake and Kitimat installations are examples of the importance of air freight facilities.

Air freight carried in 1945 totalled nearly 6,000 tons. It increased by 14 times to 84,000 tons in 1953 and dropped to 51,000 tons in 1954. The heavy increase in 1953 was due both to the Knob Lake and the Kitimat projects. In 1955 the DEW Line installations have added greatly to the air freight traffic.

The second source of direct cost of air transportation is the operation of privately-owned aircraft. No statistical information on these operations, other than the number of aircraft licensed in each year, is available. From this information an estimate has been prepared and is shown in Schedule I as "user owned" transportation.

It wil be noted that in the years 1949 and 1953 the costs of operation of these aircraft were in excess of $5 million and $8 million respectively.

There were 820 private aircraft operating in Canada in 1949, and 1,175 in 1953. The trend in Canada follows closely that of the United States as we find more and more of the large corporations purchasing aircraft for the movement of executives and goods.

Summarizing the direct cost of air transportation in Canada, Schedule I indicates an increase over the 25-year period of nearly $108 million with the major growth taking place between 1945 and 1953 when total direct costs increased from $16,521,000 to $109,482,000.

### *Indirect Cost of Air Transportation*

Total indirect cost of air transportation increased from $608,000 in 1928 to $31,255,000 in 1953. From 1945 to 1953, Schedule I shows that the indirect cost of air transportation to the general public decreased from $39,480,000 to the total mentioned above.

#### *Federal Government*

The net federal expenditures in each of the selected years were arrived at by making an analysis of departmental and other official financial reports to abstract data on all types of air transportation expenses. These were grouped into categories of subsidies, operating costs and ownership costs.

##### Subsidies

Subsidies represent direct cash payments for administration or operation purposes, such as assistance to air carriers, flying clubs, etc.

The subsidies taken into consideration in 1945 were the payments for the loss from operation of the Canadian Government Trans-Atlantic Air Services. This service, although the responsibility of the Canadian Government, was operated by Trans-Canada Air Lines as agent for the government from 1943 to mid-1947. In 1949, the $4,415,000 represents a deficit from operation of Trans-Canada Air Lines amounting to $4,318,000, the balance being made up of operating subsidies to Municipal Airports. In 1953, subsidies to Municipal Airports of $110,000 and an operating subsidy of $105,000 to Queen Charlotte Air Lines were the two amounts considered.

### Operating Costs

Current costs, where available, were obtained from Department of Transport records and were divided between the operation of airways and airports, meteorological expenses and general administrative expenses. Expenses for meteorology were allocated between air services and marine services, 50% being charged to aviation. The amounts shown in Schedule I are those charged to air transportation. It is interesting to note that total Federal current costs increased from approximately $7 million in 1945 to nearly $22 million in 1953. All expenses directly associated with National Defence were eliminated insofar as they could be so determined in the accounts of the Department of Transport.

The rate of growth between the years 1945 and 1953 was the greatest in the group of government expenses called "General Administrative and Miscellaneous". These expenses during that period grew nearly six times as against three times only in airways, airports, radio and meteorology. The following table illustrates this point:

| | 1945 | 1949 | 1953 |
|---|---|---|---|
| Airways and Airports | $ 3,201,000 | $ 8,530,000 | $10,234,000 |
| Meteorological Services (50%) | 1,185,000 | 2,275,000 | 3,168,000 |
| Radio Aviation | 2,101,000 | 4,023,000 | 5,179,000 |
| Total | $ 6,487,000 | $14,828,000 | $18,581,000 |
| General administrative and Miscellaneous | $ 586,000 | $ 1,775,000 | $ 3,284,000 |

On the other hand, an explanation for the large increase in administrative air expenses during that period is found in Canada's growing contribution to I.C.A.O. and active participation in international air, radio and meteorological conferences, larger and more numerous grants to Canadian Flying Clubs, the expansion of the Air Transport Board, etc.

### Ownership Costs

The capital costs are the five year average capital expenditures for each of the selected years of the federal government for airports, radio-aviation, meteorological aviation, grants to municipal airports and Canadian Government Overseas Air Services. These capital expenditures shown in Schedule I and detailed in Schedule IA were as follows:

| | |
|---|---|
| 1928 | $ 360,000 |
| 1936 | 2,060,000 |
| 1945 | 30,480,000 |
| 1949 | 42,184,000 |
| 1953 | 15,000,000 |

The years 1945 and 1949 show very heavy expenditures, the result of the extensive air-training programme carried out during the war which necessitated tremendous airport and runway construction throughout Canada. Even though a large proportion of military airports were financed through the Department of National Defence, nearly $200 million of capital expenditures were transferred to the Department of Transport immediately after the war. The amount paid to the United States for aviation installations in Canada was also transferred. Since 1950, the normal annual capital expenditures by the Department of Transport for air services appear to be in the neighbourhood of $15 million. In 1952, these expenditures amounted to $29,959,000, in 1953 to $10,889,000 and in 1954 to $13,650,000.

It is of some interest to note that the total federal investment in air services has grown from $813,000 in 1928 to $401,299,000 in 1953, as shown in the following table:

| | |
|---|---|
| 1928 | $ 813,000 |
| 1936 | 6,005,000 |
| 1945 | 44,202,000 |
| 1949 | 345,204,000 |
| 1953 | 401,299,000 |

The development of air facilities during the last war is reflected in the above figures where, between 1945 and 1949, the investment grew at the rate of $75 million per annum, whereas between 1949 and 1953, the growth was only $14 million per year. Included in all these figures naturally are numerous credits brought about through the transference to War Assets Disposal Corporation of the value of a number of abandoned airports and airport facilities.

Grants for capital purposes were made over a period of years by the federal government to municipally-owned airports. The accumulated totals in the selected years were as follows:

| | |
|---|---|
| 1945 | $ 3,707,000 |
| 1949 | 3,830,000 |
| 1953 | 4,373,000 |

The investment of the government in Trans-Canada Airlines Overseas Services is shown to have been as follows in the same years:

| | |
|---|---|
| 1945 | $ 3,110,000 |
| 1949 | 4,788,000 |
| 1953 | 4,788,000 |

From the subsidies, current costs and capital costs, Schedule I deducts in each of the years, for which information is available, the revenue earned by the federal government from the operation of owned facilities. These revenues increased from $333,000 in 1945 to $5,844,000 in 1953 and represent landing fees, rent, etc.

For a proper appreciation of the various items which make up these revenues two tables have been prepared for the year 1953. The first one deals with revenues and receipts from airways and airports amounting to $5,196,000.

| | 1953 |
|---|---|
| Aircraft landing fees | $ 2,268,000 |
| Rentals | 1,408,000 |
| Concessions | 635,000 |
| Dining halls, bars, heating, etc. | 624,000 |
| Miscellaneous | 261,000 |
| | $ 5,196,000 |

From the above it will be seen that landing fees constitute the largest single item of revenue. The president of Trans-Canada Airlines stated to the Royal Commission that Canadian landing fees were the highest in the world, and compared the cost to T.C.A. for landing a North Star in Canada at $19.90 as against $4.65 in the United States for an aircraft of comparable weight. Yet, the total revenues collected by the Civil Aviation Division of the Department of Transport represent only one-half of the total operating costs of airways and airports in 1953, or $10,234,000.

This second table shows the revenues credited to Aviation Radio Aids which amounted to $591,000 in 1953.

| | 1953 |
|---|---|
| Rentals | $146,000 |
| Air-ground radio service | 396,000 |
| Radio message tolls | 35,000 |
| Miscellaneous | 14,000 |
| | $591,000 |

This amount should be compared with radio aviation operating expenses which, in 1953, totalled $5,179,000.

*Provincial and Municipal Costs*

The current costs of municipal airports for which subsidies are paid by the federal government are available only for 1949 and 1953. The principal airports in which municipalities have a financial interest and which receive operating subsidies from the federal Department of Transport are Fredericton and Saint John, N.B., Brandon, Manitoba; Moose Jaw and Prince Albert, Sask.; Calgary, Edmonton, and Medicine Hat, Alberta; and Vancouver, B.C. In 1949 the net operating loss met by the above municipalities, according to records available in Ottawa, amounted to $3,000 but there was

a recorded profit of $71,000 in 1953. The total revenues in these two years amounted to $153,000 and $607,000 respectively.

The cumulative capital expenditures of municipalities and provinces are reported to have been as follows in the selected years for which information was available.

| | |
|---|---|
| 1936 | $ 1,259,800 |
| 1945 | 3,668,900 |
| 1949 | 4,706,000 |
| 1953 | 5,769,800 |

The estimated capital spent on the five year average basis in the above years was:

| | |
|---|---|
| 1936 | $ 400,000 |
| 1945 | 304,000 |
| 1949 | 255,000 |
| 1953 | 200,000 |

Compared to the annual capital and operating costs of the federal government in aviation, municipalities have not too great a financial interest in this mode of transportation.

The same is true of provincial governments across Canada, as records indicate that no airport is operated by any province and that their total investment is reported at $450,000. This amount represents two capital grants made by the Province of Ontario in 1938 and 1939, consisting of $168,000 to Malton Airport and $282,000 to Toronto Island Airport.

*Analysis of Direct and Indirect Costs*

A summary of Schedule I shows the following picture:

| Year | Direct Costs | | Indirect Costs | | Total Amount |
|---|---|---|---|---|---|
| | Amount | % of total | Amount | % of total | |
| 1928 | $ 1,724,000 | 73.9 | $ 608,000 | 26.1 | $ 2,332,000 |
| 1936 | 2,869,000 | 44.3 | 3,609,000 | 55.7 | 6,478,000 |
| 1945 | 16,521,000 | 29.5 | 39,480,000 | 70.5 | 56,001,000 |
| 1949 | 53,440,000 | 47.6 | 58,903,000 | 52.4 | 112,343,000 |
| 1953 | 109,482,000 | 77.8 | 31,255,000 | 22.2 | 140,737,000 |

In 1928, out of every dollar spent for air transportation in Canada, 26 cents was contributed through taxation and 74 cents by the user. In 1953 the picture is only slightly changed, the user contribution being 78 cents and taxation 22 cents. Since the war years the proportion of the costs contributed by government at various levels has been decreasing steadily. This is a clear indication that the volume of air transportation has grown at such a rate as to absorb its increasing share of total costs.

# 2

## HIGHWAY TRANSPORTATION

THE preparation of Schedule 2 to show the direct and indirect costs of highway transportation required a considerable amount of estimating. This was brought about by the necessity of using costs of operation for trucks and passenger automobiles instead of revenues, the formula used for air, water, rail and pipeline transportation direct costs. Urban trucks, farm trucks and highway private trucks have never reported revenues earned or costs of operation to any regulatory authority. As a matter of fact, it is only in recent years (since 1941) that some statistics have been collected from for-hire motor carriers throughout the country and even at the present time the Dominion Bureau of Statistics (D.B.S.) is completely revising its method of collecting, compiling and publishing the reports of these operators. The Bureau is in the process of developing a new statistical sampling technique based on truck operations in each province to obtain a more complete coverage. None of the reports have as yet been made public.

After considerable research, it was also discovered that no estimate has ever been made on a continuing basis in Canada of the cost of operating private cars. This aspect of the problem therefore had to be dealt with separately.

The total cost of operation of school buses was nowhere available, nor was the operation of urban trucks, highway private trucks, etc.

In order to show all of the direct highway transportation costs on the same basis, it was decided to estimate the cost of operation for each type of highway vehicle for each of the selected years. Dominion Bureau of Statistics data were used as a check in those years where this information was available. Also an extensive analysis was made of a number of cost studies published in the United States pertaining to highway operations and the results therefrom were applied to Canadian statistics with proper adjustments for prevailing conditions in this country. A great deal more study and analysis of highway transportation has been undertaken in the United States than in Canada and numerous statistical reports are available in publications of the Bureau of Public Roads, the Inter-State Commerce Commission, the American Trucking Association and the Association of American Railroads.

### *Direct Cost of Highway Transportation*

For purposes of this study, highway vehicles have been segregated into three groups: motor trucks, buses and private automobiles.

*Motor Trucks*

Motor truck registrations for each province for each year under review were set out as shown in Schedule 2A, the figures having been obtained from Dominion Bureau of Statistics reports. These registrations were reduced by 5% and rounded out to even hundreds. This adjustment was made to bring the annual published registration figures in line with the actual number of registrations in force throughout the year, since D.B.S. reports the year-end registrations which are maximum rather than average figures for the preceding calendar year.

Total average registrations for each year in each province as shown in Schedule 2A were then broken down into four basic classes of operations, i.e. farm, urban, highway private and highway for-hire. The resulting proportions varied by provinces and within provinces by years. In order to show changes in the relative importance of various classes of vehicles over the years and to arrive at proper proportions for each class of trucks in the selected years, the following basic assumptions had to be made:

(1) When motor trucks were first used in Canada they were mostly in city operations when neither load capacity nor range were important considerations. For the period 1924 to date, there was a gradual increase in the relative importance of farm, private, and over - the - road trucking as opposed to urban trucking.

(2) That the number of both private and for-hire trucks used in intercity transportation increased as a percentage of total truck registration in approximately the same proportion each year.

(3) That farm vehicles increased as a percent of total trucks up to and including 1945, and declined thereafter as other forms of trucking took precedence in relative growth. Since the end of World War II, the rapid expansion of the non-farm sectors of the economy caused a relative though not absolute decline in the importance of farm trucks to the total trucking operations.

(4) That the absolute number of urban trucks continued to increase although the proportion of urban trucks to total trucks showed a decline.

To build up operating costs on a more logical basis, it was necessary to break down registrations still further by gross vehicle weight. This segregation was applied only to total figures for Canada, as research indicated that with the exception of farm trucks there does not exist any significant difference in percentage distribution of various classes of trucks by provinces. Also, a gradual trend was observed over the years towards an increase in the average size and weight of vehicles in all classes of use. Further it was felt that an adjustment downward of 2½% should be made in highway private trucks and of 7½% in highway for-hire trucks in order

to eliminate the duplication of trucks registered in more than one province. The application of these adjustments resulted in Schedule 2B which shows numbers of vehicles in each weight class and also groupings for each year.

It was then necessary to estimate appropriate average annual mileages, working back from 1954 to 1928. These mileages were varied each year for each weight and class of truck so as to reflect the general tendency of vehicles to increase their number of miles travelled each year. The estimated annual mileages of urban, farm, highway private and highway for-hire are shown in Schedule 2C. The mileages in all cases were reduced by 1% per annum from the previous year, starting with the most recent annual data available, the year 1954.

Finally, Schedule 2D was prepared to show the average annual costs of operation for each type of truck according to gross vehicle weight. As for previous schedules on highway transportation the year 1954 is the basic year and all previous years were obtained by applying the D.B.S. index of cost of vehicle operation. Further adjustments were made to those costs which vary with mileage, for the purpose of ensuring proper costs in years where mileages are less than in 1954. These estimates are based on information gathered from the industry and on comparable information from the United States.

Schedule 2E shows the estimated average cost per mile for each type of motor truck and for each weight and class of vehicle, and was built up from the operating characteristics shown in Schedule 2C and Schedule 2D.

In all of these highway schedules the estimated costs and mileage were cross-checked with similar information available in United States publications pertaining to this type of transportation.

Schedule 2 summarizes the estimated direct annual cost of motor truck operations for the selected years. It will be seen that the following costs prevail:

| Year | Estimated Cost of Operation |
|---|---|
| 1928 | $ 313,274,000 |
| 1936 | 396,643,000 |
| 1945 | 745,483,000 |
| 1949 | 1,584,464,000 |
| 1953 | 2,986,316,000 |

There is no doubt that the above figures will come as a surprise to many Canadians as few have realized the importance to the economic structure of the large volume of highway transportation. Undoubtedly criticism can be levelled at the formula followed in the preparation of the estimates, but every effort was made and every precaution was taken to assure that the

costs used were as representative as possible of the prevailing conditions in the selected years.

*Buses*

The cost of bus transportation was divided into three parts — transit, public inter-urban carriage, and school buses. The transit data were built up from information provided in the D.B.S. publication "Electric Railways" and "Motor Carriers — Freight and Passenger". "Electric Railways" contained all data on urban systems which utilized at least some electric cars, while "Motor Carriers" provided data on urban systems which operate entirely with motor buses.

The inter-urban bus data which were obtained from the "Motor Carriers — Freight and Passenger" reports were published in 1931 and in 1941, and annually thereafter. Up to the present time the 1953 report is not available so that 1928, 1936, and 1953 data were estimated on the basis of traffic in other years.

When preparing the information pertaining to bus operations it has been assumed that carrier operating revenues represented the cost to the public of having these services provided, including vehicle operating costs, administrative costs and profit. Urban transit operating revenues for the selected years are as follows:

| Year | Urban Transit |
|---|---|
| 1928 | $ 56,133,000 |
| 1936 | 45,892,000 |
| 1945 | 98,180,000 |
| 1949 | 107,460,000 |
| 1953 | 129,791,000 |

The estimated intercity motorbus operating revenues for the selected years are as follows:

| Year | Intercity Motorbus |
|---|---|
| 1928 | $ 4,478,000 |
| 1936 | 9,418,000 |
| 1945 | 29,467,000 |
| 1949 | 47,197,000 |
| 1953 | 53,680,000 |

In the preparation of the above tables it was realized that all carriers did not report to the D.B.S. the results of their operations, and therefore the figures used are not all inclusive of urban and inter-city bus operations.

The last group of operating costs pertaining to buses is that of school buses. The data were obtained by applying to an estimate of the annual mileage operated an estimated cost per mile. In 1953 the data indicated that there were approximately 1,000 school buses registered as such in Canada, having increased from 100 in 1928, 200 in 1936, 800 in 1945, and 900 in 1949. Here again it must be remembered that a number of vehicles which are used as school buses are of the van type, and were previously included in the cost of operating trucks, since they are definitely registered as trucks.

The estimated school bus operating costs are as follows:

| Year | School Buses |
|---|---|
| 1928 | $ 279,000 |
| 1936 | 496,000 |
| 1945 | 2,276,000 |
| 1949 | 2,830,000 |
| 1953 | 3,600,000 |

*Private Automobiles*

The group of private automobiles had to be divided between taxis and strictly private motor cars. The registrations shown in the D.B.S. publication "The Motor Vehicle" for total year-end automobile registrations were used as a basis to determine the number of taxis in 1928, 1936 and 1945 as in those years the reports available did not show separate taxi registrations. In 1954 total year-end automobile registrations were reported at 2,688,465 with taxis at 36,400, or approximately 1.425% of the total. To determine 1945 the ratio was increased to 1.625% owing to a relative increase in taxis during the war, whereas in 1936 the ratio was decreased to 1.325% and estimated at 1.5% in 1928. Another adjustment made was to reduce by 5% the annual registration figures to bring them in line with the average for each year.

The year-end figures show the following table:

| Year | Private Auto Registrations | Taxis | 5% Adjustment | Total Auto Registrations |
|---|---|---|---|---|
| 1928 | 870,800 | 13,300 | 46,519 | 930,619 |
| 1936 | 976,400 | 13,100 | 52,029 | 1,041,529 |
| 1945 | 1,084,200 | 17,900 | 57,958 | 1,160,058 |
| 1949 | 1,566,100 | 22,600 | 83,652 | 1,672,352 |
| 1953 | 2,354,100 | 34,000 | 125,654 | 2,513,754 |

It was then necessary to determine the average mileage of private automobiles and these were as follows in our selected years:

| | |
|---|---|
| 1928 | 5,000 |
| 1936 | 5,800 |
| 1945 | 5,500 |
| 1949 | 6,500 |
| 1953 | 8,000 |

The 1953 estimate was arrived at after examination of the latest mileage estimates by the United States Bureau of Public Roads. Their estimate of 10,000 miles per year for the average U.S. automobile was deemed too high considering Canadian driving habits, seasonal weather problems, etc. Consideration was also given to the survey made by the Canadian Automobile Chamber of Commerce and reported in their annual "Facts and Figures of the Automobile Industry" for the year 1951. This survey showed that the estimated mileage travelled averaged from 5,800 miles per annum to 7,100 miles per annum for automobiles owned in cities and towns, and for rural ownership from 5,100 to 7,600 miles per annum.

The estimate for 1945 of 5,500 miles took into consideration wartime gas rationing which provided an annual average mileage of about 5,000 miles, plus the fact that total war rationing ended early in August.

The figure for 1949 was estimated at 6,500 miles. In the recent Report of the Select Committee on Toll Roads for the Province of Ontario, the average travel per vehicle is shown as 6,870 miles for 1945 and 8,580 for 1949 or an increase of 25%. It was felt that for Canada as a whole, and more particularly for private automobiles, an increase of 18% would be justifiable.

For 1936 the estimate of 5,800 miles is the same as used in the previous calculation of private automobile operating costs prepared for the Rowell-Sirois Commission.

Finally, the average annual estimate for 1928 at 5,000 miles took into consideration the fact that neither automobiles nor roads were as well developed in that year as they were in 1936.

The estimated cost of owning and operating an automobile in Canada for the selected years is based on an average ten year cost of operating an automobile in 1954. Schedule 2F shows that the average life of the automobile was assumed to be ten years, and the annual mileage 8,000, with

the original cost of the automobile at $2,500. The result of the analysis shows the following:

| Item | Ten-Year Period (80,000 mi.) Total Cost $ | Cost Per mi. ¢ |
|---|---|---|
| COST EXCLUDING TAXES | | |
| Depreciation | 2,450.00 | 3.063 |
| Repairs and maintenance | 889.68 | 1.112 |
| Tires and tubes | 310.00 | .388 |
| Accessories | 156.00 | .195 |
| Gasoline | 1,485.00 | 1.856 |
| Oil | 189.20 | .237 |
| Insurance | 762.00 | .953 |
| Garage tolls, etc. | 1,000.00 | 1.250 |
| Finance charges | 420.10 | .523 |
| Total | 7,661.98 | 9.577 |
| TAXES AND FEES | | |
| Gasoline tax | 540.00 | .675 |
| Licence fee | 160.00 | .200 |
| Total | 700.00 | .875 |
| TOTAL ALL COSTS | 8,361.98 | 10.452 |

The method followed in the preparation of Schedule 2F is in line with one suggested by the Bureau of Public Roads in the United States. While the general outline paralleled that recommended by the Bureau of Public Roads, allowance was made for the difference in driving habits, operating conditions, and the differences in the initial cost of automobiles and components in Canada. The resulting cost per mile shown above was multiplied by the D.B.S. index of automobile operating cost to give the appropriate cost per mile for the years prior to 1954. This index with the year 1954 as 100 produced the following results:

| Year | Index | Selected Year |
|---|---|---|
| 1928 | 74.03 | 7.738 per mile |
| 1936 | 68.70 | 7.181 " " |
| 1945 | 78.90 | 8.247 " " |
| 1949 | 87.18 | 9.112 " " |
| 1953 | 99.83 | 10.434 " " |
| 1954 | 100.00 | 10.452 " " |

*Taxis*

The method followed to obtain the estimated number of taxis in each of the selected years was described in the previous section. The average annual mileages were assumed to be as follows:

| | |
|---|---|
| 1928 | 40,000 |
| 1936 | 45,000 |
| 1945 | 50,000 |
| 1949 | 50,000 |
| 1953 | 50,000 |
| 1954 | 50,000 |

The cost per mile was estimated for the year 1954 at 8.484¢ and adjusted for previous years by the D.B.S. index in the same manner as for the private automobiles.

To determine the 1954 cost per mile it was assumed that the average life of a taxi would be three years, the original cost $2,500, the repairs and maintenance at 1 cent per mile, the average mileage per gallon at 12 miles, etc. There are approximately one and a half chauffeurs per taxi and their annual salaries including tips were estimated to be as follows in the selected years:

| | |
|---|---|
| 1928 | $ 893 |
| 1936 | 759 |
| 1945 | 1,272 |
| 1949 | 1,718 |
| 1953 | 2,603 |
| 1954 | 2,600 |

Based on the above data, it was estimated that the annual operating costs in the selected years were as follows:

| Year | Operating Cost | Salaries and Tips | Total |
|---|---|---|---|
| 1928 | $ 33,410,000 | $ 17,815,000 | $ 51,225,000 |
| 1936 | 34,361,000 | 14,915,000 | 49,276,000 |
| 1945 | 59,911,000 | 34,153,000 | 94,064,000 |
| 1949 | 83,575,000 | 58,240,000 | 141,815,000 |
| 1953 | 143,990,000 | 132,753,000 | 276,743,000 |

Reverting now to Schedule 2 it will be seen that the estimated cost of owning and operating private automobiles in Canada was as follows:

| | |
|---|---|
| 1928 | $ 336,913,000 |
| 1936 | 406,671,000 |
| 1945 | 491,777,000 |
| 1949 | 927,570,000 |
| 1953 | 1,965,014,000 |

*Indirect Cost of Highway Transportation*

An effort has been made to show in this section a segregation of the expenditures made by the various levels of government on highways and streets in Canada into three groups: capital expenditures, maintenance and operation and administration.

Insofar as the federal government is concerned, these expenditures pertained to the National Parks throughout the period under review as well as the Highway Grade Crossing Fund. Furthermore capital assistance of $20 million authorized in 1919 and expenditures made under recent legislation for the trans-Canada highway are also incorporated. There are many sums spent every year for assistance in developing roads into mines or prospective mineral areas. Unfortunately it was not possible to determine this latter form of expenditures from the public accounts.

The responsibilities of the provinces and municipalities need not be described as they are well known by everyone.

The information detailed in Schedule 2G was obtained from the D.B.S. and is based on revised figures from 1935 to date, appearing in the "Highway and Motor Vehicle" and "Highway Statistics".

The first four columns of Schedule 2G show the total expenditures, as available on highways by all levels of government. They include in the first column the construction expenditures, maintenance in the second column and administration in the third. It is not possible to segregate these expenditures or expenses into the various groups by government level, but it is possible to show what each level of government spends each year and this is done in columns 5, 6 and 7. The revenue received by the provinces from gasoline tax and licensing is shown in the last column.

Thus it will be seen that in 1953, the distribution of all monies spent on highways for construction, maintenance and administration is as follows:

| | |
|---|---|
| Federal | $ 27,037,000 |
| Provinces | 347,880,000 |
| Municipalities | 105,132,000 |
| Total | $480,049,000 |

The revenues received by the provinces stood at $307,664,000 leaving a deficit of some $40 million for the provinces or an over-all deficit of $172 million.

To follow the same formula in dealing with capital expenditures on highways as for other modes of transportation, the following table shows the five year average in each of the selected years:

| | |
|---|---|
| 1928 | $ 46,236,000 |
| 1936 | 56,876,000 |
| 1945 | 65,016,000 |
| 1949 | 182,174,000 |
| 1953 | 290,000,000 (estimated) |

Thus the amount of money spent today on streets and highways in Canada has increased more than six times in the last 25 years. The actual capital expenditures in 1952 and 1953 were of the order of $285 million in each year.

Annual maintenance expenses have grown from $22 million in 1928 to $177 million in 1953 and administration expenses from $1,866,000 in 1934, the first year in which they are reported, to $17,514,000 in 1953.

Previous to 1934, no data are available on municipal disbursements on streets, but it is of interest to note in the following table the growth of highway expenditures by each level of government.

| Year | Federal | Provincial | Municipal |
|---|---|---|---|
| 1928 | $ 2,410,000 | $ 64,596,000 | $ N/A |
| 1936 | 7,556,000 | 65,341,000 | 15,198,000 |
| 1945 | 3,976,000 | 105,513,000 | 30,178,000 |
| 1949 | 12,776,000 | 249,569,000 | 62,245,000 |
| 1953 | 27,000,000 | 350,000,000 | 110,000,000 |

The figures in the above table will not check with those in Schedule 2G because the capital expenditures have been averaged before adding maintenance and administrative expenses, but they do show that federal government disbursements are ten times greater today than they were in 1928. This clearly indicates that the federal authorities are becoming more and more involved in highway transportation.

The revenues received by the provinces, on the other hand, have increased approximately nine times between 1928 and 1953. At the same time, the excess of annual expenditures over annual revenues has risen by five times in the last quarter century or from $35 million to $179 million. These amounts which are shown in Schedule 2 constitute the indirect costs of highway transportation.

The Canadian Trucking Associations' brief showed a computation of annual costs[1] for rural roads and urban streets yearly from 1919 to 1960.

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[1] Annual costs are not the same as annual expenditures (see Introduction, Section 1). For this reason, the figures shown here differ from those shown in Schedule 2.

The results of this computation indicate a deficiency in revenues of $5,600,000 in 1928, $6,900,000 in 1936, $34,800,000 in 1945, $21,300,000 in 1949 and $16,500,000 in 1953. The method followed to produce the above has assumed an interest charge of 3% per annum on unamortized construction cost and has ignored the usual practice of adding a 1% tax on unamortized construction as representing a loss of revenues to municipalities on land which carries no assessment and is used for the general social advantage of the community at large.

If the two factors mentioned in the previous paragraph are altered by using an interest rate of 4% which would be more realistic from the point of view of provincial borrowings and also the 1% tax is included, then it appears that the excess of costs for roads and streets over gasoline tax and licence revenues would be the following:

| | |
|---|---|
| 1928 | $19,800,000 |
| 1936 | 25,700,000 |
| 1945 | 42,400,000 |
| 1949 | 47,400,000 |
| 1953 | 67,200,000 |

It is therefore apparent that no matter which method is adopted, there appears to be a deficiency between revenues and annual costs or revenues and annual expenditures. The latter was adopted in this report as being much more realistic and indicative of present trends as well as for reasons enumerated in the first few pages of the report.

At this point it will be of interest to take a closer look at the distribution of the direct costs and note what conclusions may be derived. Schedule 2 shows that highway direct costs have grown during the last 25 years from $762,302,000 to $5,415,144,000. The components of these astronomical figures are passenger cars, taxis, buses and trucks, and the following table indicates the average annual increase in costs which each type has experienced in the last quarter century.

| | |
|---|---|
| Passenger Cars | $ 65,100,000 |
| Taxis | 9,000,000 |
| Buses | 5,100,000 |
| Trucks | 106,900,000 |
| Total | $186,100,000 |

Users of trucks spent $2,986,000,000 in 1953 operations while users of private automobiles accounted for $1,965,000,000. These two types of highway vehicles are the most important in Canada's transportation picture when measured by the size of the users' contribution. One must also bear

in mind that with the exception of urban and intercity buses, the direct costs of highway transportation are actually costs only, and not operating revenues as summarized for railways, pipelines, airways and waterways. The highway figures do not therefore include a profit factor and for this reason are considered as conservative estimates. Furthermore, a reference to previous paragraphs in this section will show that effective passenger car registrations have increased from 871,000 in 1928, to 2,354,000 in 1953 or 170%. During the same time truck licences increased from 123,000 to 779,000, or 528%.

Taxis have also shown a substantial increase in registrations for the period having risen from 13,300 in 1928 to 34,000 in 1953. In Montreal alone, the number of taxis increased from 900 in 1945 to nearly 4,000 at the present time. The estimated total cost of taxi operations in Canada rose from $51,225,000 to $276,743,000 in the last quarter century or a 440% increase.

Buses, another type of highway transportation, have shown the smallest improvement in operating volume during the period covered by this study. Urban and intercity bus costs amounted to $60,600,000 in 1928 and $183,-500,000 in 1953, or an increase of only 203%. The main reason, of course, is found in that section of the bus industry which is primarily concerned with urban transportation and which according to this study increased from $56,133,000 in 1928 to $129,791,000 in 1953 or a gain of only 131% while intercity buses were able to grow from $4,478,000 to $53,680,000. It is understandable that bus transportation, generally speaking, has not evidenced the same growth as passenger automobiles which are more flexible and cheaper for family travel than any other means of transportation. In this respect buses have been subjected to the same decline as rail passenger travel which, as will be pointed out later, has lost considerable ground during the last 25 years.

An analysis of the four types of truck transport which are shown in Schedule 2 shows that the average growth that has taken place each year during the selected period was as follows:

| | |
|---|---|
| Urban ..... | $ 51,800,000 |
| Farm ..... | 6,900,000 |
| Highway private ..... | 32,000,000 |
| Highway for-hire ..... | 15,600,000 |
| | $106,900,000 |

At the same time registrations increased by 230,000 vehicles for urban trucks, 237,000 farm trucks, 132,000 highway private trucks and by 31,000 for highway for-hire trucks.

The next table shows the percentage breakdown of highway transportation direct costs by each type of trucking in each of the selected years:

| | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | % | % | % | % | % |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Urban | 91.7 | 78.3 | 59.1 | 56.5 | 52.9 |
| Farm | 3.7 | 5.7 | 8.8 | 7.2 | 6.2 |
| Highway private | 3.5 | 11.8 | 22.5 | 25.2 | 27.7 |
| Highway for-hire | 1.1 | 4.2 | 9.6 | 11.1 | 13.2 |

The most significant trend revealed by this table is the rapid growth of highway trucking, both for-hire and private. This has resulted from the great improvement in highways and the increased efficiency of highway vehicles as freight carriers. Thus, the costs of operating highway trucks have grown from 4.6% of total trucking costs in 1928, to 40.9% of the total in 1953. Because of this, the relative importance of urban trucks has been declining, despite the large increase in the number of urban truck licences during the period. Farm truck costs represented only 3.7% of total truck costs in 1928, compared with 6.2% in 1953. However, their share has been decreasing since 1945 when it was 8.8% of the total, possibly reflecting the fact that the process of farm mechanization has been fairly well completed.

Even though passenger cars have shown a tremendous growth in numbers between 1928 and 1953, they are not today as important an item as trucks in the distribution of the direct costs. The following table shows this:

| | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| Direct Costs: | % 100.0 | % 100.0 | % 100.0 | % 100.0 | % 100.0 |
| Passenger cars | 44.2 | 44.8 | 33.7 | 33.0 | 36.3 |
| Taxis | 6.7 | 5.4 | 6.4 | 5.0 | 5.1 |
| Buses | 8.0 | 6.1 | 8.9 | 5.6 | 3.5 |
| Trucks | 41.1 | 43.7 | 51.0 | 56.4 | 55.1 |

While passenger cars and trucks were equal components of highway transportation direct costs until World War II, since then trucks have forged ahead and have now established themselves in first place as the most important type of transportation on Canada's roads and streets. Taxis and buses on the other hand have shown a relative decrease in the above distribution table. The conclusions mentioned in previous paragraphs on this situation become more evident as consideration is given to the above table.

Some comments should be made on the behaviour of indirect costs as shown in Schedule 2. These costs are five-year averages in each case and have increased from $34,686,000 to $179,000,000 between 1928 and 1953. It should be noted that these figures show net indirect costs, revenues having been deducted. Looking at the gross expenditures only, the increase was from $67 million to $487 million or an average annual increase of $16,800,000. The revenues credited to these expenditures show an average annual increase of $11 million having risen from $32,300,000 in 1928 to $308 million in 1953.

The following table shows the share of expenditures made by each level of government from 1936 to 1953. (Figures are not available to show what municipalities spent on roads and streets in the year 1928.)

| | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|
| | % | % | % | % |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |
| Federal | 8.6 | 2.8 | 3.9 | 5.5 |
| Provincial | 74.1 | 75.6 | 76.9 | 71.9 |
| Municipal | 17.3 | 21.6 | 19.2 | 22.6 |

It will be noted that over the last 17 years there have been no wide fluctuations in the relative contributions of each level of government to highways. While federal authorities are spending more now than at any time since World War II, the municipalities have maintained their position and the provinces are still the large contributors. The average annual increase in the provincial share was $16,700,000 while municipal costs showed an increase of only $5,600,000 in the last 17 years. All of the amounts shown in Schedule 2 are net figures in the sense that they include for each level of government the amounts paid to or received from other levels of government. An examination of this same schedule will show that if one eliminates the federal and municipal expenditures, the net indirect costs then would be as follows:

| | |
|---|---|
| 1928 | $32,276,000 |
| 1936 | 5,719,000 |
| 1945 | 2,431,000 (CR) |
| 1949 | 48,916,000 |
| 1953 | 42,000,000 |

In arriving at the above, full credit was given to the provinces for the revenues shown in Schedule 2 even though part of this revenue, small as it may have been, accrued to the federal or municipal authorities.

At the bottom of Schedule 2 a panel indicates the distribution of indirect costs for construction, maintenance and administration. The construction figures are the average figures based on a five-year period and centered on the third year, whereas the maintenance and administration expenditures are on an annual basis. The year 1928 is incomplete and will not be considered in the following table which shows the relative proportion of each type of expenditures, no consideration being given to the origin.

| | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|
| | % | % | % | % |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |
| Construction | 65.7 | 49.6 | 57.4 | 59.8 |
| Maintenance | 30.5 | 47.1 | 38.7 | 36.6 |
| Administration | 3.8 | 3.3 | 3.9 | 3.6 |

From the above it is apparent that since World War II construction expenditures have increased in importance and as a result maintenance has decreased, while administration costs have maintained a normal level. Indeed the average annual increase in construction was $13,700,000 between 1936 and 1953 as against $8,900,000 in maintenance and $838,000 in administration.

*Analysis of Direct and Indirect Costs*

A summary of Schedule 2 shows the following picture:

| Year | Direct Costs | | Indirect Costs | | Total Amount |
|---|---|---|---|---|---|
| | Amount | % of total | Amount | % of total | |
| | $ | | $ | | $ |
| 1928 | 762,302,000 | 95.6 | 34,686,000 | 4.4 | 796,988,000 |
| 1936 | 908,396,000 | 97.0 | 28,473,000 | 3.0 | 936,869,000 |
| 1945 | 1,461,247,000 | 97.8 | 31,723,000 | 2.2 | 1,492,970,000 |
| 1949 | 2,811,336,000 | 95.8 | 123,937,000 | 4.2 | 2,935,273,000 |
| 1953 | 5,415,144,000 | 96.8 | 179,000,000 | 3.2 | 5,594,144,000 |

In 1928 out of every dollar spent on highway transportation the user paid 96 cents and the government contributed the balance. The situation has generally remained the same throughout the entire 25-year period. However, in 1953, revenues from gasoline taxes and licence fees amounted to only 88½% of total provincial expenditures on highways in that year, and to only 64% of total expenditures on highways, rural roads and urban streets by federal, provincial and municipal governments.

3

## PIPELINE TRANSPORTATION

THE pipeline is the latest major development in common carrier transportation in Canada. The first important oil pipeline was the Montreal-Portland line which was completed during World War II. By 1949, the industry had started its rapid expansion with three additional companies in operation; the B. A. Alberta Pipe Line, Ltd., The Imperial Pipe Line Company, Ltd., and the Valley Pipe Line Company, Ltd., all of which were in operation for the full year.

Operating revenues, which in 1950 totalled slightly over $4 million, by 1953 had reached the level of $27 million and in 1954 were in excess of $41 million.

Capitalization of all incorporated pipeline companies which in 1950 amounted to $108 million exceeded $333 million by the end of 1954.

In 1950, the first year for which complete records of finance and statistics are available, there were 1,400 miles of pipelines in operation in Canada. In 1953, the mileage had increased to 3,800 or an increase of 171%.

Up to the present time, there has been no federal, provincial or municipal assistance to the oil pipeline companies. Therefore, there is no indirect cost for oil pipeline transportation, the user being responsible for all direct costs, measured in this case by the revenues received by the various pipeline companies in the years 1950 and 1953.

In 1956, the federal government was authorized to advance to Trans-Canada Pipelines Limited a substantial sum of money to enable it to begin construction of a natural gas pipeline from Alberta to Winnipeg. Because these advances are to be repaid by the company, the indirect costs resulting from these advances will be temporary. However, the section of the pipeline passing through northern Ontario is to be financed by the federal and the Ontario governments.

4

# RAILWAY TRANSPORTATION

*Direct Cost of Railway Transportation*

THE direct costs of rail transportation are represented by the gross revenues of steam railways of Canada as reported to the Dominion Bureau of Statistics in each of the selected years and include revenue derived from passenger, freight, mail, dining and buffet services. Revenues earned by the railways from other incidental services are not included in the above nor are subsidy payments made by the federal government to the Canadian railways with respect to the Maritime Freight Rates Act, special assistance to the C.N.R. for the handling of iron ore from the Steep Rock mine, coal subventions and feed grain subventions. In the year 1953, payments made by the Board of Transport Commissioners to the C.P.R. and C.N.R. and known as the "Bridge Subsidy" amounting to $7 million are deducted from the freight revenue.

The payments under the Maritime Freight Rates Act are statutory and have increased during the 25-year period some 280%. The Steep Rock iron ore subsidy paid in 1945 and 1949 constituted the absorption by the federal government of part of the freight rate for the movement of iron ore from the mine to the Port Arthur docks.

A breakdown of the various amounts which were deducted in the respective years 1928 - 53 as summarized in Schedule 4 appears in the table on the following page.

## GOVERNMENT SUBSIDIES TO RAIL TRANSPORTATION

| Subsidy | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| Payments under the Maritimes Freight Rates Act | 2,759,000 | 2,506,000 | 4,346,000 | 6,982,000 | 10,481,000 |
| Steep rock ore | — | — | 275,000 | 226,000 | — |
| "Bridge" traffic | — | — | — | — | 7,000,000 |
| Rail coal subventions | 464,000 | 1,995,000 | 981,000 | 2,024,000 | 5,508,000 |
| Newfoundland coastal shipping | — | — | — | — | 1,903,000 |
| Subsidy on feed grain | — | — | 17,262,000 | 16,682,000 | 17,541,000 |
| TOTAL | 3,223,000 | 4,501,000 | 22,864,000 | 25,914,000 | 42,433,000 |

Although feed grain and coal subventions are not paid directly to the Canadian railways by the federal government, but to the shippers, the amounts represented by these subventions form part of the direct cost of rail transportation absorbed by the federal government and should not appear as a factor of transportation cost fully met by the users. The bridge subsidy does not fall in the same category as it is paid directly to the C.N.R. and C.P.R.

Schedule 4 indicates that passenger revenues in 1928 amounted to nearly $95,600,000 and in 1953 to $104,800,000. Bearing in mind that these passenger revenues include not only the passenger fares but also excess baggage, sleeping, parlour and chair cars, dining and buffet and other passenger train revenue, and that during the last 25-year period there have been a number of increases in the rates charged by the railways for these services, it becomes apparent that the passenger revenues of the railways have not kept pace with the growth of the country. Freight revenues which include express, milk, switching, demurrage and other freight train revenues increased from $442,300,000 in 1928 to $1,037,500,000 in 1953. In the case of freight revenues, these have at least more than doubled themselves during the period under review. The same remarks apply to miscellaneous revenues which include water transfer, water line and joint facilities. Mail revenues also show the same percentage increase between 1928 and 1953.

The sum total of the above is that rail revenues increased from $549 million in 1928 to $1,165 million in 1953, or by 112%.

The following table shows a yearly comparison of the freight and passenger traffic of Canadian railways from 1928 to 1953:

## STEAM RAILWAYS TRAFFIC PASSENGERS AND FREIGHT

| Year | Passengers carried[1] (thousands) | Passenger-miles (thousands) | Freight carried[1] (thousands) | Freight ton-miles (thousands) |
|---|---|---|---|---|
| | No. | No. | Tons | Tons |
| 1928 | 40,593 | 3,140,861 | 118,653 | 41,610,661 |
| 1929 | 39,071 | 2,897,215 | 115,187 | 35,025,895 |
| 1930 | 34,699 | 2,422,875 | 96,194 | 29,604,545 |
| 1931 | 26,397 | 1,748,211 | 74,130 | 25,707,373 |
| 1932 | 21,100 | 1,435,960 | 60,807 | 23,136,666 |
| 1933 | 19,172 | 1,393,041 | 57,364 | 21,092,594 |
| 1934 | 20,531 | 1,530,611 | 68,037 | 23,320,451 |
| 1935 | 20,032 | 1,584,524 | 69,141 | 24,235,167 |
| 1936 | 20,498 | 1,726,059 | 75,847 | 26,414,114 |
| 1937 | 22,039 | 1,929,443 | 82,220 | 26,926,054 |
| 1938 | 20,911 | 1,783,178 | 76,175 | 26,834,696 |
| 1939 | 20,482 | 1,751,973 | 84,631 | 31,464,991 |
| 1940 | 21,970 | 2,176,468 | 97,948 | 37,898,196 |
| 1941 | 29,779 | 3,205,542 | 116,808 | 49,982,478 |
| 1942 | 47,597 | 4,989,296 | 134,675 | 56,153,953 |
| 1943 | 57,176 | 6,525,064 | 153,314 | 63,915,074 |
| 1944 | 60,336 | 6,873,188 | 155,326 | 65,928,078 |
| 1945 | 53,408 | 6,380,155 | 147,349 | 63,349,095 |
| 1946 | 43,405 | 4,648,558 | 139,256 | 55,310,308 |
| 1947 | 40,941 | 3,732,777 | 152,856 | 60,143,035 |
| 1948 | 38,280 | 3,477,273 | 154,933 | 59,080,323 |
| 1949[2] | 34,884 | 3,193,174 | 142,719 | 56,338,231 |
| 1950 | 31,139 | 2,816,154 | 144,218 | 55,537,900 |
| 1951 | 30,996 | 3,110,241 | 161,261 | 64,300,418 |
| 1952 | 30,167 | 3,151,261 | 162,175 | 68,430,417 |
| 1953 | 28,736 | 2,985,944 | 156,249 | 65,267,016 |

Source: Dominion Bureau of Statistics, Railway Transport Annual Report.

(1) Originating traffic. Duplications eliminated.

(2) Newfoundland included from 1949.

From the above it will be noted that the passengers carried decreased from 40,593,000 in 1928 to 28,736,000 in 1953 or by 29.2% whereas passenger-miles dropped from 3,141,000,000 in 1928 to 2,986,000,000 in 1953 or by only 4.9% indicating that the passenger journey increased from 77 miles in 1928 to 104 miles in 1953, a betterment of 35.1%. During that quarter century, the record year for passenger traffic was the war year of 1944 when the number of passengers carried totalled 60,336,000 with passenger miles of 6,873,188,000 and a passenger journey of 114 miles.

Freight traffic on the other hand shows an improvement from 118,653,-000 tons carried in 1928 to 156,249,000 tons in 1953 or a betterment of 31.7%. Revenue ton-miles increased during the same period from 41,610,-661,000 to 65,267,016,000 or by 56.9%. There was a consequent increase in the average haul from 351 miles in 1928 to 418 in 1953, an improvement of 67 miles or 19.1%.

All of the above clearly indicates that the railways of Canada have lost ground relatively in the short haul business of both passenger and freight traffic.

Returning to Schedule 4, it is noted that the direct costs of rail transportation in Canada increased from $545,564,000 in 1928 to $1,122.330,-000 in 1953 or an increase of 105.7%.

### *Indirect Cost of Railway Transportation*

Total indirect cost of rail transportation borne by the general public through taxation increased from $9 million in 1928 to $61 million in 1953 or 577.8%. These indirect costs were arrived at from a review of federal, provincial and municipal government expenditures. Schedule 4 gives a breakdown of the indirect costs as contributed by the various levels of government.

#### *Federal Government*

There are five groups of expenditures made by the federal government on behalf of rail transportation:

(1) Payments to users — subsidies on traffic
(2) Payments to railways — subsidies on traffic
(3) Payments to railways — cash deficits
(4) Capital expenditures
(5) General and miscellaneous expenditures

#### *Payments to users — Subsidies on Traffic*

As already mentioned these payments include Dominion Coal Board subsidies on rail movements of coal in Canada, and feed grain subsidies paid by the Department of Agriculture to distributors and users.

Coal subsidies have been in existence for a considerable time in Canada, and presumably the increase in the cost of labour and material within the rail industry has partly contributed to the growth of the subsidies from $464,000 in 1928 to $5,508,000 in 1953. The subsidies, only the rail portion of which is shown above, cover the movement by rail and water from mines located in Nova Scotia and New Brunswick in eastern Canada, and from Alberta and Saskatchewan in western Canada. The intent of the subsidy is

to allow Canadian coal to compete with United States coal in the main markets of central Canada. The amount of coal moved by rail and covered by the subsidy has been somewhat erratic while the subventions have increased steadily as shown in the following table:

## TONNAGE AND COST OF COAL MOVED UNDER SUBVENTION BY RAIL

| Year | Coal moved under subvention | | Subventions paid | |
|---|---|---|---|---|
| | Total | Via rail | Total | To rail carriers |
| | (Tons) | (Tons) | $ | $ |
| 1928..... | 251,000 | 251,000 | 464,000 | 464,000 |
| 1936..... | 2,356,000 | 2,144,000 | 2,214,000 | 1,995,000 |
| 1945..... | 1,163,000 | 752,000 | 1,898,000 | 981,000 |
| 1949..... | 2,837,000 | 1,332,000 | 3,918,000 | 2,024,000 |
| 1953..... | 3,398,000 | 1,864,000 | 9,861,000 | 5,508,000 |

Source: Dominion Coal Board.

Feed grain subsidies were started in the early '40's and amount to approximately $17 million per annum. The subvention provides for payment of freight assistance at specified rates on western feed grain shipped to eastern Canada and British Columbia. The purpose of the policy is that feeders of livestock and poultry will receive the full benefit of the subsidy in prices paid for feed. From its inception this policy has required the payment of nearly $209 million to the end of 1953.

*Payments to railways — Subsidies on Traffic*

There are three such payments included in this group; Maritime Freight Rates Act, Northern Ontario "bridge", and Steep Rock Iron Ore. Payments made under the Maritime Freight Rates Act since its inception to March 31, 1954 have cost the federal government $122,677,000. The amount of payments made by the federal government increased considerably, from slightly over $4,300,000 in 1945 to nearly $10,500,000 in 1953. The basis of payment is generally that for each shipment originating in the Maritimes and transported locally within the Maritimes as well as shipments originating in the Maritimes for furtherance in Quebec, Ontario, and west thereof — 20% of the freight charges are met by the federal treasury.

The bridge traffic subsidy of $7 million is the result of a recommendation of the Turgeon Royal Commission wherein it was estimated that the annual cost of maintenance of way and structures of the two main transcontinental railways in northern Ontario was of the nature of $7 million, and that the shippers of certain traffic moving both east and west over these routes should be relieved of their contribution towards the maintenance of this trackage. Consequently freight rates were reduced by the amount of $7 million on

certain traffic covered by Section 468 of the Railway Act, and the federal government reimbursed the railways for this loss in revenue.

The Steep Rock iron ore subsidy, as already explained, was payment for a portion of the freight rate on iron ore from the Steep Rock mine to Port Arthur docks, and was initiated during the war period when it was important that the Steep Rock property be developed. It was a sort of development assistance to Steep Rock Iron Mines Ltd., and was discontinued in 1952.

The $1,903,000 paid by the Canadian Maritime Commission to the C.N.R. is to cover losses in the operation of the Newfoundland Coastal Services, the revenues of which are included in the rail operations.

*Payments to Railways — Cash Deficits*

One of the important items under this heading is the financial results of the operation of the C.N.R. The treatment used in this report to cover the financial responsibility of the federal government vis-à-vis the C.N.R. is predicated upon the cash deficits or surpluses appearing in the annual financial report of the Department of Transport. As shown in a later table, there were three years of cash surpluses — 1928, 1945 and 1953 — and two years of cash deficits — 1936 and 1949.

There are three railway properties of the federal government which were not transferred to the C.N.R., but are operated by the C.N.R. on behalf of the federal government. Each year special provisions are included in the estimates of the Department of Transport to reimburse the C.N.R. for capital as well as operating deficits of these properties. They are the Hudson Bay Railway, P.E.I. Ferry and Terminals, and the Newfoundland Ferry and Terminals.

The responsibility of the federal government for the deficits of the Hudson Bay Railway has been as follows:

| | |
|---|---|
| 1936 | $253,000 |
| 1945 | 500,000 |
| 1949 | 197,000 |
| 1953 | 334,000 |

In 1928 and in 1936 the P.E.I. Ferry and Terminals deficits of operation were included in the C.N.R. corporate surplus, or deficit. In the remaining years under review the deficits of operation of the P.E.I. Ferry and Terminals were as follows:

| | |
|---|---|
| 1945 | $ 688,000 |
| 1949 | 1,221,000 |
| 1953 | 1,603,000 |

The Newfoundland Ferry and Terminals subsidy is paid by the federal government to the C.N.R. for the operation of the ferry service between North Sydney and Port-aux-Basques. In 1953 the amount of the subsidy was $2,236,000.

It is to be noted that the subsidies paid by the federal government for the operation of ferry services between New Brunswick and Prince Edward Island, and Nova Scotia and Newfoundland are substantial, and are bound to increase as traffic over these arteries continues to increase. The amount of subsidy paid on each shipment to either of these ferry services is based on the ratio of the mileage made on the ferry to the total through mileage of the shipment. This means that the ferry loses money on each shipment where the ferry mileage is small in comparison to the total mileage of the shipment (for example, a shipment from Prince Edward Island to Montreal or Toronto). Therefore, the greater the traffic of this kind, the greater is the loss suffered by the ferry and the higher the federal subsidy required.

To summarize this group of federal government responsibilities, i.e. cash deficits, the following table shows the payments in the selected years:

| Item | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| Canadian National Railway: | | | | | |
| cash deficit | — | 44,553,000 | — | 41,811,000 | |
| cash surplus | (1,953,000) | — | (24,733,000) | — | (238,000) |
| Hudson Bay Railway | — | 253,000 | 500,000 | 197,000 | 334,000 |
| P.E.I. Ferry and Terminals | — | — | 688,000 | 1,221,000 | 1,603,000 |
| Newfoundland Ferry and Terminals | — | — | — | | 2,236,000 |
| Total | (1,953,000) | 44,806,000 | (23,545,000) | 43,229,000 | 3,935,000 |

Surplus (—)

*Capital Expenditures*

Schedule 4A summarizes the yearly capital expenditures made by the federal government on behalf of railway transportation from 1923 to date. The information shown thereon was obtained from official records of the Department of Transport and is divided between the C.N.R., Canadian Government Railway, Hudson Bay Railway and Terminals, Ferries and other facilities. To understand Schedule 4A, it would be well to keep in mind that the only capital expenditures of the federal government on behalf of the C.N.R., since the second revision of the capital structure, are represented by the purchase of 4% preferred stock of that company. All expenditures made by the C.N.R. on the Newfoundland Railway are shown under Canadian Government Railways while those on the Hudson Bay Railway are reported separately. The column designated "Ferries and Terminals" represents the cost of such items as the provision of terminal

facilities as well as related vessels for Borden-Tormentine, North Sydney-Port-aux-Basques, Wood Island-Caribou, etc. The last column includes such items as Canso Causeway, Ogden Point Piers, Yarmouth-Bar Harbour service and other small items.

Throughout the life of the C.N.R. there has been very close liaison, and extensive co-ordination, between the board of directors of the railway and the Department of Finance as to whether it would be more appropriate for the railway to seek its necessary funds for capital expenditures in the open market or to accept interest-bearing loans from the federal government. In a great many instances the decision was that the government should act as banker. The latest capital revision did not change this arrangement.

An analysis of the records up to 1952 failed to discover any sums advanced to the C.N.R. from year to year on which interest charges were not made. Since that time the C.N.R. has received part of its financial assistance through purchase by the federal government of 4% preferred stock on which dividends are paid only if earned.

In Schedule 4A the first column shows the function performed by the federal treasury in acting as a banker for the C.N.R. All other columns indicate actual cash disbursements for physical properties made by the federal government since 1923. It will be noted that insofar as the Canadian Government Railways are concerned, the only large expenditure was in 1949 when the Newfoundland steamers were purchased as part of the Confederation agreement. The Hudson Bay Railway and Terminals expenditures are practically negligible since 1931 when the railway and the terminals were opened to traffic. The Ferries and Terminals, Steep Rock Railway & Dock and other railway facilities, such as the Canso Causeway, came into being in the last 10 to 12 years and there is no doubt that these expenditures are not of a recurring nature, at least not until such time as these facilities need to be replaced in another 25 or 30 years.

Therefore, the logical approach to the capital expenditures of the federal government on behalf of railway transportation is to average on a yearly basis all of the items accumulated in Schedule 4A with the exception of Loans and Advances — Net. It is considered that these amounts of capital expenditures, which are the same in each of the selected years, are as close to the capital expenditures of the federal government vis-à-vis railway transportation as can be determined.

Looking at the total investment of the federal government in railways, it appears that the government investment on March 31, 1955, amounted to $1,743,633,000, whereas in 1923 it was only $991,000,000. These figures were obtained from the annual reports of the Department of Transport and reflect all adjustments which have taken place during that period. To produce a schedule which would incorporate annually all the adjustments over this 32-year period was not feasible and the net result was Schedule 4A, which gives consideration only to the major adjustment.

*General and Miscellaneous Expenditures*

In this group are included administrative expenses of the Department of Transport and of the Board of Transport Commissioners for Canada, as well as minor expenses borne by the federal government in connection with survey of Newfoundland's railway facilities, and the share paid by the federal government for the Inter-Colonial and P.E.I. Railway Employees' Provident Fund and other unclassified items. The present cost of administration of the Board of Transport Commissioners is not quite $1 million, having risen from $313,000 in 1945 and $334,000 in 1928.

*Provincial Expenditures*

There are two railways that are provincially owned in Canada, the Pacific Great Eastern and the Ontario Northland. The annual financial responsibilities of the provinces concerned are shown in Schedule 4. The Province of Ontario has not assisted the Ontario Northland during the period under review. The operations of that railway have been sufficiently remunerative to take care of all its financial requirements, including the purchase of new equipment and other capital expenditures. The balance sheet of the Ontario Northland shows a non-interest provincial loan of $30,208,000 dating back to the inception of the railway.

The Province of British Columbia has not been so fortunate with the Pacific Great Eastern. The deficits from operations paid by the province were as follows in the selected years:

| | |
|---|---|
| 1928 | $2,733,000 |
| 1936 | 3,559,000 |
| 1945 | 4,182,000 |
| 1949 | 6,014,000 |
| 1953 | 6,095,000 |

The operating conditions of the Pacific Great Eastern were most difficult for many years, but with the now completed section to Prince George and the Vancouver-Squamish line well under construction, an appreciable improvement can be anticipated.

The capital expenditures which were undertaken by the Pacific Great Eastern with money made available by the province were as follows from 1947 to date:

| | |
|---|---|
| 1947 | $ 877,000 |
| 1948 | 807,000 |
| 1949 | 1,786,000 |
| 1950 | 6,810,000 |
| 1951 | 7,218,000 |
| 1952 | 5,058,000 |
| 1953 | 2,027,000 |
| 1954 | 2,736,000 |
| 1955 | 12,462,000 |

Previous to 1947, it was impossible to determine with any degree of accuracy the actual capital expenditures. The above table reflects the construction programme which has taken place since 1949 as well as the purchase of new equipment.

It should be mentioned that in 1951 and 1952 the federal government assisted the construction of the Prince George extension by a subsidy of $15,000 per mile or $825,000 in 1951 and $403,500 in 1952 for a total of 81.9 miles. At the present time, there is an offer to the Pacific Great Eastern of a federal subsidy of $25,000 per mile for a possible extension from Prince George towards the Peace River District.

### *Analysis of Direct and Indirect Costs*

A summary of the above gives the following:

| Year | Direct Costs | | Indirect Costs | | Total Amount |
|---|---|---|---|---|---|
| | Amount | % of total | Amount | % of total | |
| | $ | | $ | | $ |
| 1928..... | 545,564,000 | 98.4 | 8,982,000 | 1.6 | 554,546,000 |
| 1936..... | 318,092,000 | 84.0 | 60,659,000 | 16.0 | 378,751,000 |
| 1945..... | 730,833,000 | 98.8 | 8,622,000 | 1.2 | 739,455,000 |
| 1949..... | 843,255,000 | 91.0 | 83,058,000 | 9.0 | 926,313,000 |
| 1953..... | 1,122,330,000 | 94.9 | 60,590,000 | 5.1 | 1,182,920,000 |

The substantial variations in the proportions of the railway transportation costs that are borne by the government are accounted for by the fluctuating fortunes of the Canadian National Railways. In 1936 and 1949 the C.N.R. had substantial deficits and, in 1928, 1945 and 1953, it had surpluses.

The 1953 figures are not truly comparable to those of the other years because of the recapitalization of the C.N.R. in 1952. This involved the substitution of 4% non-cumulative preferred stock for interest-bearing loans and advances, thus relieving the railway of the necessity of paying large amounts of interest to the government in loss years. Therefore, interest payments to the government are included in all years but 1953 as an indirect cost of transportation in Schedule 4 and in the table above.

If the C.N.R. deficits and surpluses are removed from the figures, the federal and provincial government assistance to the railways has been as follows:

| Year | Amount | % of Total |
|---|---|---|
| 1928 | $10,935,000 | 2.0 |
| 1936 | 16,106,000 | 4.8 |
| 1945 | 33,355,000 | 4.4 |
| 1949 | 41,247,000 | 4.7 |
| 1953 | 60,828,000 | 5.1 |

Thus, the amount of government assistance to the railways has increased considerably over the years in dollar amount, but since 1936 only slightly as a percentage of total expenditures on railways.

# 5

## WATER TRANSPORTATION

WATER carriage has the oldest history of any form of transportation in Canada. Long before Confederation, public works such as wharves, docks, canals and dredging had been undertaken by local governments; since 1867, this work has been handled by the federal government. The latest important venture is the present undertaking to deepen the St. Lawrence Waterway to allow ships of 27 feet draught to reach the Great Lakes area, and to permit the present fleet of Great Lakes vessels to go down to Montreal, Quebec, Sept Iles and the Atlantic Ocean.

### *Direct Cost of Water Transportation*

In Schedule 5 are shown the gross revenues earned by domestic public carriers for each of the selected years. It will be noted that these revenues increased from $64 million in 1928 to $259 million in 1953 or approximately four times during the 25-year period. All "Canadian-owned" shipping operators having their vessels registered in Canada have been included in the compilation of revenues earned. In other words, deep sea operators, lake carriers, coastal operators, and Mackenzie River companies form part of this total.

The true costs of water transportation to Canadians are greater than the costs as shown in this section because it was not feasible to obtain figures for foreign (including British) registry ships plying to and from Canadian ports.

The Dominion Bureau of Statistics published its first report on water transportation in 1947. Previous to that time no complete revenue information was available from any of the federal government departments concerning water transportation other than fragmentary data in the Board of Transport Commissioners and the Department of Trade and Commerce. Therefore, the figures for 1928, 1936 and 1945 were partly estimated on the basis of information supplied by the major water carriers. The results obtained are as shown in Schedule 5.

Included in the reports for the years 1949 and 1953 are the revenues earned by a number of ocean carriers having ships registered in Canada. Most

of these operators came into being immediately after World War II, when they accepted the offer of the federal government to purchase and operate under the Canadian flag, ships which were the property of a Crown company called Park Steamship Company, the revenues of which are included in the years 1945 and 1949. The returns of the Canadian National West Indies services are also included for the years during which this company was in operation. Canadian Pacific and Canadian National B.C. Coast operations are also included, since the returns of these operations are not part of the gross revenues of the two railways, but are part of "other income".

The important Canadian water carriers in 1953 whose gross revenues form part of Schedule 5 are Canada Steamship Lines Ltd., Canadian Transport Company Ltd., Clarke Steamship Company Ltd., Colonial Steamships Ltd., Imperial Oil Shipping Ltd., N.M. Patterson & Sons Ltd., Saguenay Terminals Ltd., Union Steamships Ltd., Upper Lakes & St. Lawrence Transportation Company Ltd., Western Canada Steamships Ltd., and the British Columbia Coast Services of the Canadian Pacific and Canadian National.

From the revenues earned by the domestic public water carriers, (Schedule 5) subsidy payments are deducted in each of the selected years. These subsidy payments are twofold in nature. First there are the steamship subsidies paid by the Department of Trade and Commerce until the establishment of the Canadian Maritime Commission in 1945 and thereafter by the Commission. These subsidy payments were made both for the maintenance and operation of services essential to the transportation requirements of certain areas in Canada, such as the north shore of the St. Lawrence, B.C. Coast and Inter-provincial Ferry Services, and the development of Canadian trade with South Africa, South America, Australia, etc. Generally speaking the latter type of subsidy was completely abolished at the time of the formation of the Canadian Maritime Commission. In 1928 the subsidies paid to deep sea operators, whose revenues are not included in Schedule 5 amounted to $355,000, and in 1936 to $1,505,000 as shown in the following table:

## STEAMSHIP SUBSIDIES

| Year | To Local Services | To Ocean Services | Total |
|---|---|---|---|
| 1928 | $ 667,000 | $ 355,000 | $1,022,000 |
| 1936 | 610,000 | 1,505,000 | 2,115,000 |
| 1945 | 980,000 | — | 980,000 |
| 1949 | 2,139,000 | — | 2,139,000 |
| 1953 | 2,166,000 | — | 2,166,000 |

Source: Canadian Maritime Commission.

In 1953, the principal local services which received direct subsides from the federal government through the Canadian Maritime Commission were the following:

| Service | Contractor | Subsidy |
|---|---|---|
| Vancouver and Northern B.C. Ports | Union Steamships Ltd. | $345,000 |
| Grand Manan and the Mainland | Saint John Marine Transports Ltd. | 95,000 |
| Mulgrave and Canso | Canso Shipping, Fishing and Industries Ltd. | 82,000 |
| Murray Bay & North Shore (Winter) | | 50,000 |
| Quebec, Natashquan & Harrington | Clarke Steamship Co. Ltd. | 520,000 |
| Quebec, Montreal & Gaspe | | 156,000 |
| Owen Sound & Manitoulin Island | Owen Sound Transportation Co. Ltd. | 70,000 |
| Pictou, Souris & Charlottetown & Magdalen Islands | Magdalen Islands Transportation Co. | 120,000 |
| P.E.I. and Nova Scotia (Wood Island) | Northumberland Ferries Ltd. | 158,000 |
| Rimouski, Matane and North Shore | Lower St. Lawrence Transportation Ltd. | 126,000 |

The largest single subsidy in 1953 was to the C.N.R. to cover the loss in operation of the Newfoundland Coastal Services. As this amount is treated as "miscellaneous rail revenue" in the accounts of the C.N.R., it is omitted from this water transportation study.

The second type of subsidy payment is that made to water carriers by the Dominion Coal Board for the movement of coal from mines in the Maritime Provinces to destinations mostly in Quebec and Ontario.

The Dominion Coal Board annual reports show the following subsidies for water transportation paid in the selected years:

| | |
|---|---|
| 1928 | $ — |
| 1936 | 219,000 |
| 1945 | 917,000 |
| 1949 | 1,894,000 |
| 1953 | 4,354,000 |

The direct costs to users of transportation have increased from $63,257,000 in 1928 to $252,987,000 in 1953.

### *Indirect Cost of Water Transportation*

The total indirect costs of water transportation borne by the general public through taxation increased from $34 million in 1928 to over $70 million in 1953, or roughly 100%. These costs are those of the federal government only because the information pertaining to subsidies paid by certain provincial governments and municipalities for the operation of ferry services or coastal services was not readily available.

There are four general headings covering federal government expenditures as follows:

(1) Harbours, waterways and marine services

(2) Capital costs

(3) Subsidies and similar payments to carriers and users

(4) Other expenditures.

#### *Harbours, Waterways and Marine Services*

In this group of expenses are included the operating costs of harbours, canals and marine services, which increased from $10,951,000 in 1928 to $32,703,000 in 1953.

The cost data pertaining to the National Harbours Board are not included in this group of indirect costs because they are recovered from revenues. It was felt that these revenues of the National Harbours Board originated for the most part from other carriers, such as railways and steamship lines, and would appear in their books as expenses. Hence the propriety of excluding them in order to avoid duplication. The operating deficits of the National Harbours Board are also not included despite the fact that they are met by the federal government. The operations of the National Harbours Board have resulted in alternating deficits and surpluses, and so the debt to the government is small and will probably be repaid.

The harbour data included in Schedule 5 cover the numerous facilities originally constructed by the Department of Public Works and subsequently transferred for operating purposes to the Department of Transport. These data cover extensive facilities throughout Canada on rivers, lakes and ocean coasts. A review was made of this group of expenditures for the purpose of deducting therefrom capital amounts in order to leave only operating expenditures.

The harbours' expenditures shown in Schedule 5 consist of the following:

| | |
|---|---|
| 1928 | $ 2,308,000 |
| 1936 | 4,330,000 |
| 1945 | 2,794,000 |
| 1949 | 10,743,000 |
| 1953 | 7,845,000 |

Canal operating costs for all main line canals, as well as secondary canals, were obtained from the annual reports of the Department of Transport. These costs increased from $2,400,000 in 1928 to nearly $9 million in 1953. None of these expenses include monies voted for the St. Lawrence Seaway other than for the operation of the Special Projects Branch of the Department of Transport. It was the responsibility of this branch to prepare plans and specifications as well as general policy documentation previous to the establishment of the St. Lawrence Seaway Authority.

Marine services costs generally include not only the annual expenses of the Department of Transport Marine Services, but also steamship inspection, operation of vessels, and the St. Lawrence River ship channel service, whose responsibility it is to maintain the channel between the entrance to the Lachine Canal, in Montreal, and the eastern tip of the Island of Orleans, to a depth of 35 feet. The distribution of marine services expenses for the year 1953 is as follows :

| | |
|---|---|
| Administration agencies | $ 578,000 |
| Aids to navigation | 5,830,000 |
| Nautical services | 409,000 |
| Pilotage services | 559,000 |
| Steamship inspection | 547,000 |
| Marine service steamers | 7,037,000 |
| Marine signal service | 188,000 |
| Ship channel service | 714,000 |
| Total | $15,862,000 |

*Source:* Department of Transport Annual Report, 1953

*Capital Costs*

In Schedule 5A is shown the yearly capital expenditures of the federal government for water transportation and in Schedule 5 a five-year moving average for the selected years as follows:

| | |
|---|---|
| 1928 | $23,695,000 |
| 1936 | 7,544,000 |
| 1945 | 5,742,000 |
| 1949 | 20,197,000 |
| 1953 | 30,000,000 |

It is evident from the above that the expansion of facilities for water transportation does not occur during a period of emergency but rather at times when thought is being given to reducing the cost of water transportation, such as in the late '20's when the present Welland Canal was being finished and presently, the completion of the St. Lawrence Seaway. Very little money was spent during the war by the government on water transportation, but immediately afterward new contracts were given for the improvement of the channel in the St. Lawrence, for additions to the Department of Transport fleet of vessels, for construction of new docks, etc. Whereas during the war years, capital expenditures were at a level of $4 million per annum, they are now of the order of $30 million per annum. In 1953, these capital expenditures amounted to $35 million.

All of these capital expenditures are made by the federal government on its owned facilities with no anticipation of a direct financial return therefrom.

The total investment of the federal government in water transportation has increased from $443 million in 1928 to over $758 million in 1953. A breakdown of the present investment is as follows:

| | Year 1953 |
|---|---|
| Harbours | $244,973,000 |
| Canals | 242,990,000 |
| St. Lawrence Ship Canal | 109,549,000 |
| Public Works Dredging | 133,392,000 |
| Marine Services Ships | 25,173,000 |
| Radio and Met. Services | 2,359,000 |

The investments in harbours exclude those of the National Harbours Board, a Crown Company, but do include the myriad of docks and wharves built by the Department of Public Works along the coasts, rivers and lakes of Canada. The investment in these facilities rose from $122 million in 1928 to $245 million in 1953, a 100% increase during the 25-year period. Canal investment on the other hand shows an increase of only $26 million during the same period. Dredging investment in the St. Lawrence tripled, whereas Public Works Department dredging increased by 100%. The fleet of the Department of Transport shows the greatest increase in investment in the water transportation group. In 1928 the accounts report only $3 million invested in vessels, in 1945, $7,600,000 and in 1953 it had risen to over $25 million. The main reasons for this increase are found in the responsibility to supply stations in the North with new icebreakers and service vessels, as well as a replacement programme for vessels outmoded and costly to operate.

*Subsidy and Similar Payments to Carriers and Users*

The anual expenses of the federal government for subsidies are made up of three separate items, two of which have already been dealt with in discussing the direct costs of water transportation. It will be recalled that subsidies by the Canadian Maritime Commission, and those paid by the Dominion Coal Board, were enumerated in separate tables and deducted from the gross revenues of water carriers. This is the contra item to show the expenses of the federal government and naturally insofar as the steamship subsidies are concerned for the years 1928 and 1936 they include payments made to ocean carriers. The coal subsidies remain the same, and the third item is the cash surplus or deficits of the Canadian National (West Indies) Steamships.

The results of operation of this Crown Company were as follows:

| | | $ — |
|---|---|---|
| 1928 ..... | — | |
| 1936 ..... | Deficit | 574,200 |
| 1945 ..... | Surplus | 1,116,100 |
| 1949 ..... | Deficit | 460,500 |
| 1953 ..... | Deficit | 649,700 |

*Source:* Canadian National (West Indies) Steamships, Annual Reports.

The total subsidy payments of the federal government for water transportation in Canada have increased approximately seven times between 1928 and 1953, or from $1,022,000 to $7,170,000.

*Other Expenditures*

This group of expenses of the federal government includes the administration of the Canadian Maritime Commission, one-third of the Department of Transport general administration, as well as current expenses of the radio division and the meteorological division of air services chargeable to marine. In 1953 the distribution of these expenses was as follows:

| | |
|---|---|
| Canadian Maritime Commission ..... | $ 133,000 |
| General Administration of Transport (1/3).. | 508,000 |
| Radio Division charged to Marine ..... | 2,136,000 |
| Meteorological Division charged to Marine .. | 380,000 |
| | $3,157,000 |

Schedule 5 indicates that this group of expenses has increased by $1,400,000 between 1945 and 1953.

The last item to be dealt with in indirect costs is the revenue received by the federal government from the operation of its owned services and facilities. There are three general headings under which a closer look can be made of these revenues, i.e. canal services, marine services and harbours. Insofar as 1953 is concerned the main revenue-producing items in canal services were as follows:

| | 1953 |
|---|---|
| Rentals ..... | $1,013,000 |
| Wharfage ..... | 234,000 |
| Linesmen fees ..... | 253,000 |
| Miscellaneous ..... | 65,000 |
| Total | $1,565,000 |

It will be noted that the total revenues collected by the Canals Branch of the Department of Transport were very small in 1953 compared to the operating expenses of canal services which reached a level of nearly $9 million in that year. Furthermore, revenues increased only $300,000 in the 25-year period as against an increase of $6,500,000 in expenses.

The revenues received from the operation of marine services amounted to $946,000 of which the major items were as follows:

| | 1953 |
|---|---|
| Aids to navigation ..... | $414,000 |
| Steamship inspection ..... | 156,000 |
| Marine service steamers ..... | 53,000 |
| Radio aids — marine ..... | 271,000 |
| Nautical services ..... | 36,000 |
| Miscellaneous ..... | 16,000 |
| | $946,000 |

Operating expenses under marine services are shown in Schedule 5 to have amounted to $15,862,000 in 1953, in other words the cost of operating these facilities far exceeded the insignificant revenues collected for their use from the public in general. The third group of revenues, those collected by the Department of Public Works for the operation of the Board's harbour and river facilities across Canada, amounted to $346,000 in 1953 as against a total expenditure of $7,845,000.

*Municipal Harbour Commissions*

There are a number of municipal harbour commissions which have been constituted by federal acts to develop and operate local harbour facilities. Some of these have from time to time received loans from the federal treasury but generally speaking they operate successfully and meet all of their operating expenses. From records available it appears that in the selected years the surplus of revenue over expenses was as follows:

| | |
|---|---|
| 1928 | $ 137,000 |
| 1936 | 189,000 |
| 1945 | 735,000 |
| 1949 | 860,000 |
| 1953 | 1,082,000 |

The important local commissions in 1953 were the following: Belleville, Hamilton and Toronto, Ont., Winnipeg, Man., New Westminster, North Fraser and Port Alberni, B.C.

No consideration has been given to the financial aspect of these local harbours as it is felt that their revenue and capital expenditures were obtained from the general public through expenses of water, rail and highway carriers. In other words the same treatment is given to these local commissions as to National Harbours Board revenues and it has been assumed that none of the municipalities contributed to capital expenditures.

***Analysis of Direct and Indirect Costs***

A summary of Schedule 5 shows the following picture:

| Year | Direct Costs | | Indirect Costs | | Total Amount |
|---|---|---|---|---|---|
| | Amount | % of total | Amount | % of total | |
| | $ | | $ | | $ |
| 1928 | 63,257,000 | 65.1 | 33,937,000 | 34.9 | 97,194,000 |
| 1936 | 53,516,000 | 72.2 | 20,586,000 | 27.8 | 74,102,000 |
| 1945 | 227,707,000 | 93.0 | 17,230,000 | 7.0 | 244,937,000 |
| 1949 | 216,141,000 | 80.8 | 51,271,000 | 19.2 | 267,412,000 |
| 1953 | 252,987,000 | 78.3 | 70,171,000 | 21.7 | 323,158,000 |

The above table shows that from 1928 to 1953, direct water transportation costs increased far more, proportionately, than did indirect costs. Therefore, indirect costs, which amounted to about 35% of total water transportation costs in 1928, amounted to about 22% of the total in 1953. However, since 1945, indirect costs have risen far more rapidly than the revenues of domestic public carriers, and have increased from 7% of total in 1945 to 22% in 1953.

## SUMMARY 1928 - 1953

In the previous five sections, separate detailed analyses have been made of the direct and indirect costs of five modes of transportation. It might be well to compare in one table the results of Schedules 1 to 5 insofar as the figures indicate the share contributed to the total costs by the users on the one hand and by the various levels of governments on the other:

| COST | | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|---|
| | | % | % | % | % | % |
| Air | — direct | 73.9 | 44.3 | 29.5 | 47.6 | 77.8 |
| | indirect | 26.1 | 55.7 | 70.5 | 52.4 | 22.2 |
| Highway | — direct | 95.6 | 97.0 | 97.8 | 95.8 | 96.8 |
| | indirect | 4.4 | 3.0 | 2.2 | 4.2 | 3.2 |
| Pipeline | — direct | — | — | — | — | 100.0 |
| | indirect | — | — | — | — | — |
| Rail | — direct | 98.4 | 84.0 | 98.8 | 91.0 | 94.9 |
| | indirect | 1.6 | 16.0 | 1.2 | 9.0 | 5.1 |
| Water | — direct | 65.1 | 72.2 | 93.0 | 80.8 | 78.3 |
| | indirect | 34.9 | 27.8 | 7.0 | 19.2 | 21.7 |

One observation is that until 1953 pipeline transportation had been free of government financial assistance and that the user had paid all its costs. Air and water transportation have shown greater fluctuations in the user's sphere than did highway and rail during the last 25 years. This is largely explained by the fact that air transportation actually came of age in Canada after the end of World War II and since that time its use has grown from year to year at a very rapid tempo. Mention has been made that little government money is spent on water transportation during war years although considerable sums have been spent since Confederation. The relationship between the users' costs in this type of transportation and federal government costs is subject to considerable fluctuations.

The direct costs of air and water transportation were both 78% of their respective total in 1953, though the amounts were quite different. It will be recalled that the direct cost of air transportation in that year was $109,500,-000, as against $253 million for water transportation. It can therefore be said that at the present time the users contribute directly 78 cents of every dollar spent on air and water transportation and governments 22 cents. Of the latter amount, the provinces and the municipalities contribute a small share.

In the five years studied, the relationship between direct and indirect highway transportation costs has varied only slightly. In each of these years, the proportion of highway transportation costs paid for directly by the users was between 95.6% and 97.8% of the total. This means that even though the federal, provincial and municipal governments have defrayed large indirect costs of highway travel, their share of the total expenditures is only about 3% to 4%.

In two years (1928 and 1945) the users of railway transportation came very close to paying the total costs of rail traffic, the share having been roughly 99%. In 1936 this portion was only 84%. The fluctuations in the proportions which direct costs bear to the total costs are principally due to the annual results of operation of the C.N.R.

It might be of interest to look at the picture as a whole and see what the user pays and what the government contributes. The following table summarizes that situation.

| Year | Direct % | Indirect % | Total % |
|---|---|---|---|
| 1928 ..... | 94.6 | 5.4 | 100.0 |
| 1936 ..... | 91.9 | 8.1 | 100.0 |
| 1945 ..... | 96.1 | 3,9 | 100.0 |
| 1949 ..... | 92.6 | 7.4 | 100.0 |
| 1953 ..... | 95.3 | 4.7 | 100.0 |

Some consideration should be given to a short analysis of the proportion of the direct cost of each type of transportation as related to the total cost. Schedule 6 shows what the actual amounts were in the selected years and the following table shows their distribution:

| Total Direct Costs | 1928 % 100.0 | 1936 % 100.0 | 1945 % 100.0 | 1949 % 100.0 | 1953 % 100.0 |
|---|---|---|---|---|---|
| Airways | 0.1 | 0.2 | 0.7 | 1.3 | 1.6 |
| Highways | 55.5 | 70.8 | 60.0 | 71.6 | 78.2 |
| Pipelines | — | — | — | — | 0.4 |
| Railways | 39.8 | 24.8 | 30.0 | 21.5 | 16.2 |
| Waterways | 4.6 | 4.2 | 9.3 | 5.6 | 3.6 |

The first major conclusion from an examination of the above and Schedule 6 is that although rail transportation shows more than a 100% increase during the last 25-year period if measured by gross revenues or direct costs, its importance in the total transportation outlay has been

decreasing during the same period. Whereas rail was 39.8% of the total in 1928, it was only 16.2% in 1953. These observations are based on actual dollar expenditures, with no adjustment for changes in dollar value. On the other hand, the amount of money spent by the user for highways and streets has increased seven times between 1928 and 1953 or from $762,302,000 to $5,415,144,000. At the same time, the relationship between direct highway costs and total direct costs has grown from 56% in 1928 to 78% in 1953. It should be remembered that in the highway direct costs are included not only for-hire trucks but all other trucks, buses, taxis and private automobiles. Highway common carriers during the same period increased their level of contributions from $3,510,000 to $394,165,000, or one hundredfold as compared with a doubling of rail revenues.

Although the ratio of air transportation direct costs to total direct transportation costs is still relatively small, it should be noted that there has been a gradual increase, from 0.1% in 1928 to 0.7% in 1945 to 1.6% in 1953. Measured in actual dollars the increase has been from $1,724,000 to $109,482,000 — a very marked progress.

Pipeline transportation came into the picture for the first time in 1953 in the present analysis. Its importance is reflected in its contribution which is shown at 0.4% or $27 million.

Statistics show that the share of water transportation has remained fairly constant, at approximately 4.6% of the total, except in 1945 when it rose to 9.3% as a result of the large ocean fleet operated under the Canadian flag. In dollar volume however, water transportation costs increased from $63 million in 1928 to $253 million in 1953, or more than three times.

From the above brief analysis it is impossible not to conclude that of Canada's four main transportation methods in operation during the last 25 years, railways have lost considerable ground compared with air, water and highway. Even if the analysis were limited to the years 1945 and 1953, the same conclusion would be reached except for water transportation, as explained above.

Turning now to indirect costs or to the outlay of governments, it is noted that they increased from $78 million in 1928 to $341 million in 1953 — more than four times. The following table shows the percentage distribution of these expenditures. Pipelines, which as already noted are self-sufficient, are excluded.

| | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| Total Indirect Costs | % 100.0 | % 100.0 | % 100.0 | % 100.0 | % 100.0 |
| Airways | 0.8 | 3.2 | 40.7 | 18.6 | 9.1 |
| Highways | 44.3 | 25.1 | 32.7 | 39.0 | 52.4 |
| Railways | 11.5 | 53.6 | 8.9 | 26.2 | 18.0 |
| Waterways | 43.4 | 18.1 | 17.7 | 16.2 | 20.5 |

From the above and Schedule 6, it is evident that air facilities were given considerable assistance during World War II since these services were given the major share of government monies spent in those years. However, in 1953, air services received less than 10% of government outlays. Highways on the other hand received 52.4% in 1953 compared to 25.1% in 1936 and 39.0% in 1949. Railways experienced wide fluctuations depending, of course, on the results of operation of the C.N.R. In 1953, rail's share was 18.0% of the total whereas water's portion was 20.5%. In 1928 when the Welland Canal was under construction, water transportation soared to 43.4%. One comment which is also evident from a perusal of Schedule 6 is that in 1953, when economic conditions were possibly normal by today's standards, highway transportation received as much assistance as the total of all other traffic agencies. The figures work out at $179 million for highways compared with $162 million for air, rail and water. Also it might be added that the user's share of highway transportation has increased in volume approximately 3 times between 1945 and 1953 while the government's share increased 5.6 times during the same period.

Lastly, Schedule 6 points out that between 1928 and 1953, the average annual increase in the total of direct and indirect costs was of the nature of $232,679,000. Of this total, direct costs contributed $222,167,000 and indirect costs $10,512,000 — 95.5% and 4.5% respectively.

It might be of some interest to compare the annual growth of direct costs in each mode of transportation during the same period. The following table indicates the annual average between 1928 and 1953.

| | Annual Amount |
|---|---|
| Airways | $ 4,300,000 |
| Highways | 186,100,000 |
| Pipelines | 1,100,000 |
| Railways | 23,100,000 |
| Waterways | 7,600,000 |
| Total | $222,200,000 |

No matter what approach is taken to analyze the relationship between the five types of transportation, one must always come to the conclusion that the roads and streets of Canada are used to a much greater extent to produce transportation than all other facilities combined. In 1953 highway transportation, as measured by direct costs, amounted to $5.4 billion as against $1.5 billion for air, rail, pipeline and water — 78.3% and 21.7% respectively.

As for the future trend of direct transportation costs, this will be discussed in the next section in order to avoid repetition of data necessary for consideration of the future as well as the behaviour of the G.N.P.

# SECTION II

# TRANSPORTATION COSTS AS A PERCENTAGE OF THE GROSS NATIONAL PRODUCT

## INTRODUCTION

THERE are many differences between the method used in compiling the Gross National Product and that used in preparing the estimates of transportation costs contained in Section I. Industrial or business accounting is done for specific purposes and frequently its objectives differ from those of national accounting. By contrast the latter is undertaken to fulfil broad purposes, and results are derived through a variety of means which understandably give little direct consideration to transportation activity. In fact, some official transportation statistics are often collected as an administrative by-product and are collated in a form which is unsuitable for specific transportation use.

For these reasons the transportation costs compiled in Section I contain certain duplications which could not be removed. Several examples will suffice to indicate the nature of this duplication. In calculating the cost of private automobile operations, gasoline costs were based on the price paid at the retail outlet. Included in the retail price, however, is the transportation cost of either a prior rail, truck, pipeline or water movement. Therefore, this cost appears both as a direct cost to the automobile owner, and revenue (direct cost) for the for-hire carrier moving the product. Another example is to be found in the provision of highway facilities. Included in the cost calculation are construction materials which at some stage were moved by a for-hire carrier and therefore appear as revenue (direct cost) for the carrier as well as an expenditure (indirect) made by a government. This type of duplication precludes the propriety of adding all the costs in Section I and of expressing them as a percentage of the G.N.P.

A second difficulty is that certain indirect taxes which are included in the G.N.P. have been eliminated from the transportation costs shown in Section I. For example, in calculating government expenditures on highways and airports, provincial gasoline taxes and motor vehicle licence fees and federal government aircraft landing fees were subtracted from gross government expenditures on these facilities. Indirect costs in Section I, therefore, are *net* government expenditures whereas in the G.N.P. government expenditures are gross amounts. In some respects, therefore, the data in Section I are overstated, in others understated.

The problem of measuring the value of transportation activity or the burden of transportation costs by relating them to the G.N.P. is not peculiar to Canada alone. For example, the United Kingdom's Department of

Scientific and Industrial Research attempted in 1949 to measure the percentage of the G.N.P. accounted for by road transport. In a paper presented to the Royal Statistical Society, Mr. E. Rudd stated:

> It is very difficult to form any accurate estimate of the amount of duplication in the gross output of road transport. The only information available to the Road Research Laboratory from which any part of it can be estimated is the number of vehicles owned by the petroleum companies in September, 1950. From this it can be estimated that users' payments for fuel included very roughly £5 million spent on transporting it by road. There will be other duplications equal to the sums spent to carry road materials, new vehicles and tyres, for use in Britain, and the materials from which they are made, by road. It seems unlikely that these duplications exceeded 10 percent of the value of the output of these items.

Attempts to do much the same thing in the United States have met with similar problems. The United States Bureau of Transportation Economics and Statistics in the January 1955 issue of its publication *Transport Economics* pointed out that because of duplication in transportation revenues, comparisons between direct user costs and the gross national income are useful only for the purpose of indicating trends.

While it is not possible for these reasons to express the transportation costs shown in Section I as a percentage of the G.N.P., it is revealing to trace the trend in Canadian transportation costs in the G.N.P.; it gives an indication of the shift which has been taking place in national transportation costs over the past quarter century between the different carriers as well as between the for-hire and private segments of the transportation industry as a result of technological change, the growth of competition, price changes, and the influence of legislation, fiscal policy and administrative action. All these factors can have an important effect on the competitive framework within which the transportation industry conducts its business.

## COMPARISON OF TRENDS IN DIRECT TRANSPORTATION COSTS AND THE G.N.P. - 1928 - 1953

*For-Hire Intercity Transportation*

Between 1928 and 1953, user payments for air, highway and pipeline activity, show a greater percentage increase than the G.N.P. while those for rail and water carriers show a smaller increase. The G.N.P. improved by 48% between 1949 and 1953, airline and motor carrier direct user costs (user revenues) went up by about 105% and 102% respectively. The importance of pipelines is just beginning to become evident, having increased approximately sevenfold during the same period. Rail and water carriers lagged badly relative to other carriers and the G.N.P., railway revenues having increased 33% and water carriers only 17%. Compared with 1928, however, water carriers showed a larger gain than railways and, of course, with the completion of the St. Lawrence Seaway, water transportation will undoubtedly assume greater importance in the total transportation picture. These important considerations appear in detail in the following table.

### TREND IN USER COSTS OF FOR-HIRE INTERCITY TRANSPORTATION AND THE GROSS NATIONAL PRODUCT

*(Freight and Passengers)*

*($000,000)*

| Year | Railways | Motor Vehicles | Airlines | Water Carriers | Pipelines | Gross National Product |
|---|---|---|---|---|---|---|
| 1928 | $ 545.6 | $ 8 | $ 1.7 | $ 63.3 | — | $ 6,105 |
| 1936 | 318.1 | 26 | 2.9 | 53.5 | — | 4,701 |
| 1945 | 730.8 | 101 | 16.5 | 227.7 | — | 11,850 |
| 1949 | 843.2 | 222 | 53.4 | 216.1 | 4 | 16,462 |
| 1953 | 1,122.3 | 448 | 109.5 | 253.0 | 27 | 24,449 |
| | | | Index (1949 = 100) | | | |
| 1928 | 64.7 | 3.6 | 3.2 | 29.3 | — | 37.1 |
| 1936 | 37.7 | 11.7 | 5.4 | 24.8 | — | 28.6 |
| 1945 | 86.7 | 45.5 | 30.9 | 105.4 | — | 72.0 |
| 1949 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1953 | 133.1 | 201.8 | 205.1 | 117.1 | 675.0 | 148.5 |
| | | | Ratio to Gross National Product (% of Gross National Product) | | | |
| | | | | | | Total |
| 1928 | 8.9% | 0.1% | (1)% | 1.0% | —% | 10.0% |
| 1936 | 6.8 | 0.6 | 0.1 | 1.1 | — | 8.6 |
| 1945 | 6.2 | 0.9 | 0.1 | 1.9 | — | 9.1 |
| 1949 | 5.1 | 1.3 | 0.3 | 1.3 | (1) | 8.0 |
| 1953 | 4.6 | 1.8 | 0.4 | 1.0 | 0.1 | 7.9 |

(1) Less than .05%.

The ratio of railway revenues to the G.N.P. has been steadily dropping and in 1953 was only slightly more than half the 1928 figure. While this has been due in part to the growth of competition, as can be observed from the continuous and marked increases in for-hire motor carrier costs, there are other equally important considerations which are difficult to assess, such as changes in the composition of railway traffic which can have a significant effect on the trend in railway revenues. Revenues can fall without a corresponding drop in traffic if the percentage of low-rated traffic is increasing. Then too, the average length of haul and technological changes resulting in increased efficiency can have precisely the same effect. Finally if the prices of commodities in general are advancing more sharply than are railway rates, then the G.N.P. would naturally increase more rapidly than would rail revenues. The effective increase in railway rates, as measured by the average revenue per ton-mile, increased by only 50% between 1928 and 1953 because of the effects of competition, statutory rates, etc., but wholesale and retail prices advanced more sharply. The direct costs of water carriers have remained relatively constant throughout the past quarter century, the notable exception being in 1945 when there was a sharp increase due to wartime traffic.

While the duplications noted earlier make it technically inaccurate to add together the ratios in the previous table to compare one year with another, it would seem that the revenues of for-hire carriers as a group show a decreasing ratio to the G.N.P. today compared with former years, the ratio of 10.0% in 1928 dropping to 7.9% in 1953.

The trend has been much the same in the United States, but less extreme, as is illustrated in the table below for the years 1945, 1949 and 1953, data for 1928 and 1936 not being available.

## UNITED STATES

## TREND IN USER COSTS OF FOR-HIRE INTERCITY TRANSPORTATION AND THE GROSS NATIONAL PRODUCT

*(Freight and Passengers)*

*($000,000)*

| Year | Steam Railways | Motor Carriers | Scheduled(1) Air Carriers | Pipelines | Water Carriers | Gross National Product |
|---|---|---|---|---|---|---|
| 1945 | $9,135.5 | $1,959.7 | $ 283.9 | $ 304.3 | $ 172.7 | $213,558 |
| 1949 | 8,884.7 | 3,465.3 | 760.2 | 376.5 | 274.7 | 257,301 |
| 1953 | 11,065.2 | 5,540.5 | 1,275.2 | 591.2 | 391.3 | 364,857 |
| | | | Index (1949 = 100) | | | |
| 1945 | 102.8 | 56.6 | 37.3 | 80.8 | 62.9 | 83.0 |
| 1949 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1953 | 124.5 | 159.9 | 167.7 | 157.0 | 142.4 | 141.8 |
| | | | Ratio to Gross National Product (% of Gross National Product) | | | |
| | | | | | | Total |
| 1945 | 4.3% | 0.9% | 0.1% | 0.1 | (2)% | 5.4% |
| 1949 | 3.4 | 1.3 | 0.3 | 0.1 | 0.1 | 5.2 |
| 1953 | 3.0 | 1.5 | 0.3 | 0.2 | 0.1 | 5.1 |

Sources: Association of American Railroads, Interstate Commerce Commission; Civil Aviation Administration U.S. Department of Commerce.

(1) Domestic and International Service. (2) Less than 0.1%.

An interesting aspect of United States transportation user costs is the relative insignificance of water carriers. The reason for this is not the unimportance of inland water transport, but rather the great preponderance of private carriers. It is also possible that statistical coverage of for-hire water carriers is far from complete because of lack of regulation of bulk carriers. Again while it is not possible to add the costs of the individual carriers and express them as a percentage of the G.N.P., it is reasonable to do so for purposes of comparing the relative importance of for-hire transportation costs between countries, as probably the same duplication exists in the figures of each country.

The following table, therefore, shows the ratio of for-hire transportation costs to the G.N.P. for Canada, United States, and the United Kingdom. Data for the latter were only available for 1954: therefore, it was necessary to compare the relationship of Canada and the United States for 1953 with that of the United Kingdom for 1954:

## COMPARISON FOR-HIRE INTERCITY TRANSPORTATION COSTS AND THE GROSS NATIONAL PRODUCT

***Canada — United States — United Kingdom***

| | CANADA | | UNITED STATES | | UNITED KINGDOM | |
|---|---|---|---|---|---|---|
| | For-Hire Transp. Costs | % of GNP | For-Hire Transp. Costs | % of GNP | For-Hire Transp. Costs | % of GNP |
| | (000,000) | | (000,000) | | (000,000) | |
| Railways | $ 1,122.3 | 4.6% | $ 11,065.2 | 3.0% | £ 460 | 2.9% |
| Air | 109.5 | 0.4 | 1,275.2 | 0.3 | 65 | 0.4 |
| Highway | 448.0 | 1.8 | 5,540.5 | 1.5 | 498 | 3.2 |
| Water | 253.0 | 1.0 | 391.3 | 0.1 | N.A. | — |
| Pipelines | 27.0 | 0.1 | 591.2 | 0.2 | — | — |
| Total | 1,959.8 | | 18,863.4 | | 1,023 | |
| G.N.P. | 24,449.0 | 7.9% | 364,857.0 | 5.1% | 15,718 | 6.5% |

From the above it would appear that a larger proportion of Canada's economic resources is used in for-hire transportation than in either the United Kingdom or the United States. This is understandable, however, when viewed against comparative population figures and distances over which traffic must move to market. The United Kingdom average rail haul was approximately 97 miles compared with 418 miles in Canada in 1953. Canada, moreover, is much more dependent upon export market than is the United States, thus tending towards longer haul traffic. In fact the surprising thing is that the spread between the three countries is as small as it is. Moreover, the spread would appear to be narrowing. In 1945, for example, the ratio of for-hire transportation in Canada to the G.N.P. was 9.1% compared to 5.4% in the United States, while in 1953 the ratios were 7.9% and 5.1% respectively.

A comparison of railway user costs in Canada and the United States is shown below:

## TREND IN RAILWAY USER COSTS AND THE G.N.P. CANADA AND THE UNITED STATES

### CANADA

| Year | User Costs | Index 1949 = 100 | Gross National Product | Index 1949 = 100 | % of GNP |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1928 | $ 545.6 | 64.7 | $ 6,105 | 37.1 | 8.9% |
| 1936 | 318.1 | 37.7 | 4,701 | 28.6 | 6.8 |
| 1945 | 730.8 | 86.7 | 11,850 | 72.0 | 6.2 |
| 1949 | 843.2 | 100.0 | 16,462 | 100.0 | 5.1 |
| 1953 | 1,122.3 | 133.1 | 24,449 | 148.5 | 4.6 |
| **UNITED STATES[1]** | | | | | |
| 1928 | 6,322 | 71.2 | 97,900 | 38.0 | 6.5% |
| 1936 | 4,197 | 47.2 | 82,743 | 32.2 | 5.1 |
| 1945 | 9,136 | 102.8 | 213,558 | 83.0 | 4.3 |
| 1949 | 8,885 | 100.0 | 257,301 | 100.0 | 3.4 |
| 1953 | 11,065 | 124.5 | 364,857 | 141.8 | 3.0 |

1) Source: Association of American Railroads. U.S. Department of Commerce.

From the above table it will be observed that railway revenues in Canada have historically loomed larger as a ratio to the G.N.P. than railway revenues in the United States, 4.6% and 3.0% respectively in 1953. In both countries, however, their relative importance to the economy has shown much the same downward trend. The G.N.P. in Canada has increased by 48.5% between 1949 and 1953 whereas rail revenue increased by only 33.1%. In the United States the G.N.P., rose by 41.8% during the same period and rail revenues by only 24.5%

Similar data for the United Kingdom are available only for the years 1949 and 1954. The comparison between Canada and the United Kingdom is indicated in the table below:

### CANADA

| Year | Railway User Costs | Index 1949 = 100 | Gross National Product | Index 1949 = 100 | % of GNP |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1949 | $ 843.2 | 100.0 | $16,462 | 100.0 | 5.1 |
| 1953 | 1,122.3 | 133.1 | 24,449 | 148.5 | 4.6 |
| **UNITED KINGDOM** | | | | | |
| 1949 | £330 | 100.0 | £10,970 | 100.0 | 3.0 |
| 1954[1] | 460 | 139.4 | 15,718 | 143.3 | 2.9 |

[1] 1953 data not available.

The ratio of rail user costs to the G.N.P. as indicated above in the United Kingdom is considerably less than in Canada. Canada's G.N.P. increased by 48.5% since 1949 while for the United Kingdom the increase was 43.3%. Rail revenues were 33.1% higher in Canada while for the United Kingdom the comparable increase was 39.4%.

From the next table it will be observed that in 1953 the ratio of intercity motor carrier costs to the G.N.P. is slightly higher in Canada than in the United States. The growth of user costs (direct) for motor carriers increased more rapidly in Canada than in the United States between 1949 and 1953 — 101.8% in Canada compared with 59.9% in the United States. The reason for this is probably that motor carrier operations had been developed to a much greater extent prior to the war in the United States than in Canada. As in the case of railways, therefore, motor carrier costs would appear to account for more of the nation's economic resources in Canada than in the United States.

## TREND IN INTERCITY FOR-HIRE MOTOR CARRIER COSTS and the GROSS NATIONAL PRODUCT—CANADA AND THE UNITED STATES

### CANADA

| Year | User Costs | Index 1949 = 100 | Gross National Product | Index 1949 = 100 | % of GNP |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1928 | $ 8 | 3.6 | $ 6,105 | 37.1 | 0.1% |
| 1936 | 26 | 11.7 | 4,701 | 28.6 | 0.6 |
| 1945 | 101 | 45.5 | 11,850 | 72.0 | 0.8 |
| 1949 | 222 | 100.0 | 16,462 | 100.0 | 1.3 |
| 1953 | 448 | 201.8 | 24,449 | 148.5 | 1.8 |

### UNITED STATES

| | | | | | |
|---|---|---|---|---|---|
| 1928 | N.A. | | 97,900 | 38.0 | |
| 1936 | N.A. | | 82,743 | 32.2 | |
| 1945 | 1,959.7 | 56.6 | 213,558 | 83.0 | 0.9% |
| 1949 | 3,465.3 | 100.0 | 257,301 | 100.0 | 1.3 |
| 1953 | 5,540.5 | 159.9 | 364,857 | 141.8 | 1.5 |

Data for the United Kingdom are available only for the year 1949 and they include taxis and urban bus operations. For purposes of comparison

with the Canadian figures, therefore, taxis and urban bus user costs for Canada are included in the table below:

INTERCITY FOR-HIRE MOTOR CARRIER COSTS
and the
GROSS NATIONAL PRODUCT
CANADA AND THE UNITED KINGDOM

| Year | User Costs | Gross National Product | % of GNP |
|---|---|---|---|
| | **CANADA** | | |
| | (000,000) | (000,000) | |
| 1949..... | $471 | $16,462 | 2.9% |
| | **UNITED KINGDOM** | | |
| 1949..... | £428 | 10,970 | 3.9% |

The ratio of Canadian pipeline user charges has grown very rapidly since 1949, revenues having increased by more than sixfold in 1953. The ratio in that year was approximately the same for Canada and the United States, 0.11% and 0.16% respectively. Details are shown below:

UNITED STATES
COMPARISON PIPELINE USER COSTS AND GROSS NATIONAL PRODUCT

| | CANADA | | | UNITED STATES | | |
|---|---|---|---|---|---|---|
| Year | User Costs | Gross National Product | % of GNP | User Costs | Gross National Product | % of GNP |
| | (000,000) | (000,000) | | (000,000) | (000,000) | |
| 1945..... | $ | $11,850 | | $304.3 | $213,558 | .14% |
| 1949..... | 4 | 16,462 | (1) | 376.5 | 257,301 | .15 |
| 1953..... | 27 | 24,449 | .11% | 591.2 | 364,857 | .16 |

(1) Less than .05%.

Inadequacy of United States data rules out any useful comparison between Canada's direct water carrier costs and those of the United States. Similarly there is no information on which to base a comparison between Canada and the United Kingdom.

*Private Transportation*

Private transportation costs, consisting very largely of motor vehicle operations, have grown to substantial proportions in the past quarter century as indicated in the table below. While there are some private air and water operations, no official data were available. Private transportation now looms

much larger than for-hire transportation as a consumer of the nation's economic resources.

| Year | Private Transportation Costs(1) | Index 1949 = 100 | Gross National Product | Index 1949 = 100 | % of GNP |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1928..... | $ 647 | 27.6 | $ 6,105 | 37.1 | 10.6% |
| 1936..... | 787 | 33.6 | 4,701 | 28.6 | 16.7 |
| 1945..... | 1,168 | 49.9 | 11,850 | 72.0 | 9.9 |
| 1949..... | 2,340 | 100.0 | 16,462 | 100.0 | 14.2 |
| 1953..... | 4,561 | 194.9 | 24,449 | 148.5 | 18.7 |

(1) Includes an annual depreciation charge for trucks and passenger cars. The G.N.P., however, includes the annual sales value of trucks and passenger cars.

No information was available for either the United States or the United Kingdom with which to compare the trend in the private transportation costs and the G.N.P. In both countries, however, it is known that substantial expenditures are made on private transportation. United States has the largest number of cars per capita of any country in the world. While the United Kingdom lags well behind both the United States and Canada in this respect, there are nevertheless large numbers of private cars. As for private trucking, it is probably even more extensively developed in the United States and in the United Kingdom than it is in Canada. Its importance in the United States is clear from the following statement taken from *Bus and Truck Transport,* March 1956:

> The United States Census Bureau estimates private carriers, which include everything from a single truck farmer to National Dairy Products with 12,000 vehicles, account for about two-thirds of all intercity ton-miles in the U.S.

In the United Kingdom, private carriers account for more than 50% of all intercity tons of highway traffic. In volume 117-1954 of the Royal Statistical Society it is stated that 55% of the United Kingdom's intercity highway ton-miles are performed by private carriers.

The growing significance of the costs of private transportation to the national economy is clear from the following table which compares this trend with that of for-hire intercity user costs to the G.N.P. The figures should be tempered by the known duplications which exist.

| Year | Gross National Product | For-Hire Intercity Costs | % of GNP | Private Transportation Costs | % of GNP |
|---|---|---|---|---|---|
| | (000,000) | (000,000) | | (000,000) | |
| 1928..... | $ 6,105 | $ 618.6 | 10.1% | $ 647 | 10.6% |
| 1936..... | 4,701 | 400.5 | 8.5 | 787 | 16.7 |
| 1945..... | 11,850 | 1,076.0 | 9.1 | 1,168 | 9.9 |
| 1949..... | 16,462 | 1,338.7 | 8.1 | 2,340 | 14.2 |
| 1953..... | 24,449 | 1,959.8 | 7.9 | 4,561 | 18.7 |

## FUTURE TRENDS IN DIRECT TRANSPORTATION COSTS AND THE G.N.P. 1960 - 1980

In examining the trend in direct transportation costs and the G.N.P. between 1928 and 1953, actual dollar values were used. Estimates of future trends in the G.N.P., prepared by the Royal Commission's staff, are in constant 1949 dollars. Therefore, for purposes of comparing the trends in future transportation costs and in the G.N.P., all estimates are expressed in constant 1949 dollars. Moreover, to link the past with the future, 1953 figures are shown in each of the tables prepared for estimates of the future. These were obtained by converting 1953 transportation costs and G.N.P. figures to constant 1949 dollars, and for this reason the 1953 figures in the tables to follow are lower than those which have been used in the first part of this section and in Section I.

Estimates of future direct transportation costs reflect, to a considerable extent, either data presented at the Royal Commission's hearings or information developed in individual reports specially prepared for the Commission.

Trends in motor vehicle direct costs, for example, have been based on future estimates of truck and automobile registrations developed in a study of The Canadian Automotive Industry. This study forecasts the following growth in motor vehicles between 1953 - 80:

| Year | Automobiles | Trucks |
|---|---|---|
| 1953 | 2,514,000 | 773,000 |
| 1960 | 3,715,000 | 1,050,000 |
| 1965 | 4,725,000 | 1,275,000 |
| 1970 | 5,900,000 | 1,500,000 |
| 1975 | 7,250,000 | 1,775,000 |
| 1980 | 8,750,000 | 2,075,000 |

Pipelines, while still in their infancy, have been growing at a rapid rate, and great difficulties arise in attempting to forecast future traffic. The basis of the estimate for pipelines is petroleum production data presented to

the Royal Commission by the Imperial Oil Company covering the next quarter century.

Estimates of airline direct costs presented equally difficult problems because of the rapid technological changes which the industry has been undergoing and the continued changes which may reasonably be expected with the introduction of jet aircraft between 1960 and 1965 and the probable emergence of commercial helicopter services between 1965 and 1970. Estimates submitted by the two major scheduled airlines to the Royal Commission were given careful consideration in forecasting direct user costs for the industry as a whole.

The effects of the completion of the St. Lawrence Seaway are reflected in the estimates for water carriers.

As for railways, some information was provided the Royal Commission in the submission of one of the major companies as to the probable potential traffic growth. While this was used as a basis for the estimates of future railway direct costs, careful consideration was also given to the anticipated growth in traffic of such new services as the Quebec North Shore and Labrador Railway, as well as developments which may reasonably be anticipated over the next quarter century from the growing reliance on Canada as a major source of the world's mineral requirements.

The effect of a number of important economic considerations was reviewed but could not be properly assessed. These considerations include the trend in rates and fares, and regulatory and other policies which will not only directly influence the size of the total transportation market but also its future distribution between the individual carriers.

### *For-Hire Intercity Transportation*

It was observed that between 1928 and 1953 the trend in the ratio of intercity for-hire direct transportation costs to the Gross National Product had been gradually falling. This trend is expected to continue over the next quarter century. It is estimated, however, that with the exception of railways, direct user costs of each of the other carriers, (excluding bus operations, data for which are not available) will increase by as much or more than the Gross National Product. Pipeline revenues will increase by over 600%, airlines by nearly 300%, and motor and water carriers by over 200%. The estimated increase in railway revenues, on the other hand, is only 73% compared to a forecast growth in Gross National Product of 204%. Expressed as a ratio to Gross National Product, it is estimated that railway direct costs will drop from 4.6 in 1953 to 2.6 in 1980; motor

carriers will be unchanged at 1.8; other carriers will show an increase — airlines from 0.41 to 0.52; pipelines from 0.11 to 0.28; and water carriers from 1.0 to 1.1. The following table illustrates these trends:

## TRENDS IN DIRECT INTERCITY FOR-HIRE TRANSPORTATION COSTS AND THE G.N.P. *1953-1980*

*(constant 1949 dollars)*

*(000,000)*

| Year | Railways | Motor Vehicles | Airlines | Water Carriers | Pipelines | G.N.P. |
|---|---|---|---|---|---|---|
| 1953..... | $ 935 | $ 361 | $ 84 | $ 211 | $ 23 | $20,353 |
| 1960..... | 1,055 | 504 | 140 | 325 | 55 | 26,100 |
| 1965..... | 1,180 | 640 | 190 | 395 | 80 | 32,300 |
| 1970..... | 1,305 | 785 | 230 | 480 | 108 | 40,700 |
| 1975..... | 1,460 | 948 | 280 | 570 | 140 | 50,300 |
| 1980..... | 1,620 | 1,090 | 320 | 680 | 175 | 61,900 |

*Index (1953 = 100)*

| Year | Railways | Motor Vehicles | Airlines | Water Carriers | Pipelines | G.N.P. |
|---|---|---|---|---|---|---|
| 1953..... | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1960..... | 112.8 | 139.6 | 166.7 | 154.0 | 239.1 | 128.2 |
| 1965..... | 126.2 | 177.3 | 226.2 | 187.2 | 347.8 | 158.7 |
| 1970..... | 139.6 | 217.4 | 273.8 | 227.5 | 469.6 | 200.0 |
| 1975..... | 156.1 | 262.6 | 333.3 | 270.1 | 608.7 | 247.1 |
| 1980..... | 173.3 | 301.9 | 381.0 | 322.3 | 760.9 | 304.1 |

*Ratio to G.N.P.—% of G.N.P.*

| | | | | | | Total |
|---|---|---|---|---|---|---|
| 1953..... | 4.6 | 1.8 | 0.41 | 1.0 | 0.11 | 7.92 |
| 1960..... | 4.0 | 1.9 | 0.54 | 1.2 | 0.21 | 7.85 |
| 1965..... | 3.7 | 2.0 | 0.59 | 1.2 | 0.25 | 7.74 |
| 1970..... | 3.2 | 1.9 | 0.57 | 1.2 | 0.27 | 7.14 |
| 1975..... | 2.8 | 1.9 | 0.56 | 1.2 | 0.28 | 6.74 |
| 1980..... | 2.6 | 1.8 | 0.52 | 1.1 | 0.28 | 6.30 |

While admitting that for reasons of duplication it is not possible to add together the direct user costs of all carriers to obtain a meaningful total, it seems reasonable to do so for the purpose of illustrating the probable shift in the importance of each carrier to the transportation picture during the next quarter century. The following table indicates a continued decline in railway direct costs relative to the total for the transportation industry as a whole with an increase for each of the other carriers.

***Direct Transportation Costs of Individual Carriers as a Percentage of Total For-Hire Direct Costs***

| Year | Total Direct Cost | Railways(1) | Motor Vehicles(1) | Airlines(1) | Water Carriers(1) | Pipe-lines(1) | Total |
|---|---|---|---|---|---|---|---|
| | (000,000) | | | | | | |
| 1953... | $1,614 | 57.9% | 22.4% | 5.2% | 13.1% | 1.4% | 100% |
| 1960... | 2,079 | 50.8 | 24.2 | 6.7 | 15.6 | 2.7 | 100 |
| 1965... | 2,485 | 47.5 | 25.8 | 7.6 | 15.9 | 3.2 | 100 |
| 1970... | 2,908 | 44.9 | 27.0 | 7.9 | 16.5 | 3.7 | 100 |
| 1975... | 3,398 | 43.0 | 27.9 | 8.2 | 16.8 | 4.1 | 100 |
| 1980... | 3,885 | 41.7 | 28.1 | 8.2 | 17.5 | 4.5 | 100 |

1) Percentage of total.

### *Private Transportation*

Private transportation direct costs have been increasing steadily since 1928 and were 18.7% of the G.N.P. in 1953. Based on the estimate of the future number of private cars and trucks made in the Royal Commission study *The Automotive Industry*, this trend will continue until 1965. Thereafter, the ratio of private transportation direct costs to the G.N.P. will gradually decline. This is indicated in the table below:

***Trend in Private Transportation Costs and the G.N.P. — 1953-1980***

***(constant 1949 dollars)***

| Year | Estimated Private Transportation Costs(1) | Index 1953 = 100 | Gross National Product | Index 1953 = 100 | % of GNP. |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1953..... | $ 3,797 | 100.0 | $20,353 | 100.0 | 18.7 |
| 1960..... | 5,772 | 140.8 | 26,100 | 128.2 | 22.1 |
| 1965..... | 7,263 | 177.2 | 32,300 | 158.7 | 22.5 |
| 1970..... | 8,888 | 216.9 | 40,700 | 200.0 | 21.8 |
| 1975..... | 10,843 | 264.6 | 50,300 | 247.1 | 21.6 |
| 1980..... | 13,124 | 320.2 | 61,900 | 304.1 | 21.2 |

(1) Includes privately owned automobiles, private intercity, urban and farm trucks. Sufficient past data were not available from which to estimate future costs of other forms of private transportation.

### *Comparison of Trend For-Hire Intercity and Private Transportation Costs*

The ratio of direct transportation costs of for-hire intercity carriers to the G.N.P. has shown a continuous drop from 10.1% in 1928 to 7.9%

in 1953 (in constant 1949 dollars). By 1980 it is estimated that the ratio will be 6.3%. On the other hand, it is estimated that the ratio of private transportation costs to the G.N.P., which in 1928 was 10.6% and in 1953 18.7%, will be 21.2% by 1980. It is anticipated that the trend towards greatly increased use of private intercity transportation facilities will continue.

*Comparison of the Trend in For-Hire Intercity and Private Transportation Costs and the G.N.P. — 1953-1980*

| Year | Gross National Product | For-Hire User Costs | % of GNP | Private Transportation Costs | % of GNP |
|---|---|---|---|---|---|
| | (000,000) | (000,000) | | (000,000) | |
| 1953..... | $ 20,353 | $ 1,614 | 7.9% | $ 3,797 | 18.7% |
| 1960..... | 26,100 | 2,079 | 8.0 | 5,771 | 22.1 |
| 1965..... | 32,300 | 2,485 | 7.7 | 7,263 | 22.5 |
| 1970..... | 40,700 | 2,908 | 7.1 | 8,887 | 21.8 |
| 1975..... | 50,300 | 3,398 | 6.8 | 10,843 | 21.6 |
| 1980..... | 61,900 | 3,885 | 6.3 | 13,124 | 21.2 |

*Motor Vehicle Costs and the G.N.P.*

The growing importance of motor vehicle direct costs as an element of total transportation cost is clear from a comparison of the trends in costs of operation of passenger cars and trucks with the G.N.P. over the next quarter century.

It is estimated that the user costs of private automobile operation in 1953 (1949 constant dollars) were $1,808 million and the ratio to the G.N.P. was 8.9%. Over the next quarter century it is estimated that these costs will increase to $5,893 million, based on 8,750,000 vehicles, and the ratio to the G.N.P. to 9.5%. Automobile direct costs, therefore, will increase by 226% between 1953 and 1980 compared with an increase in the G.N.P. of 204% as indicated in the following table:

*Trend in Private Automobile User Costs and the G.N.P. — 1953-1980*

| Costs | Automobile Costs | Index 1953 = 100 | G.N.P. | Index 1953 = 100 | % of GNP |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1953..... | $ 1,808 | 100.0 | $ 20,353 | 100.0 | 8.9% |
| 1960..... | 2,542 | 140.6 | 26,100 | 128.2 | 9.7 |
| 1965..... | 3,218 | 178.0 | 32,300 | 158.7 | 10.0 |
| 1970..... | 3,998 | 221.1 | 40,700 | 200.0 | 9.8 |
| 1975..... | 4,906 | 271.3 | 50,300 | 247.1 | 9.8 |
| 1980..... | 5,893 | 325.9 | 61,900 | 304.1 | 9.5 |

It is estimated that between 1953 and 1980 direct costs of all trucks (private and for-hire, urban and rural), will increase by 214% compared with an increase of 204% in the G.N.P. The ratio of direct costs to the G.N.P. will therefore go up only slightly from 13.0% in 1953 (constant 1949 dollars) to 13.4% in 1980. These trends are indicated in the following table:

*Trend in the Direct Costs of all Trucks and the G.N.P. — 1953-1980*

*(constant 1949 dollars)*

| Year | Motor Truck Costs | Index 1953 = 100 | G.N.P. | Index 1953 = 100 | % of G.N.P. |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1953..... | $ 2,652 | 100.0 | $ 20,353 | 100.0 | 13.0% |
| 1960..... | 3,734 | 140.8 | 26,100 | 128.2 | 14.3 |
| 1965..... | 4,685 | 176.7 | 32,300 | 158.7 | 14.5 |
| 1970..... | 5,675 | 214.0 | 40,700 | 200.0 | 13.9 |
| 1975..... | 6,885 | 259.6 | 50,300 | 247.1 | 13.7 |
| 1980..... | 8,321 | 313.8 | 61,900 | 304.1 | 13.4 |

Its is estimated that intercity truck costs (for-hire and private) will increase by 237% or at a slightly higher rate than total motor vehicle costs between 1953 and 1980; and that the ratio to the G.N.P. will go up from 5.4% to 6.0% as indicated in the following table:

*Trend in Intercity Truck Costs (For-Hire and Private) and the G.N.P. 1953-1980*

*(constant 1949 dollars)*

| Year | Intercity Truck Costs | Index 1953 = 100 | G.N.P. | Index 1953 = 100 | Index GNP—100 |
|---|---|---|---|---|---|
| | (000,000) | | (000,000) | | |
| 1953..... | $ 1,107 | 100.0 | $ 20,353 | 100.0 | 5.4% |
| 1960..... | 1,590 | 143.6 | 26,100 | 128.2 | 6.1 |
| 1965..... | 2,040 | 184.3 | 32,300 | 158.7 | 6.3 |
| 1970..... | 2,512 | 226.9 | 40,700 | 200.0 | 6.2 |
| 1975..... | 3,067 | 277.1 | 50,300 | 247.1 | 6.1 |
| 1980..... | 3,729 | 336.9 | 61,900 | 304.1 | 6.0 |

From a study of the above tables, it is apparent that highway transportation costs are expected to increase relative to the G.N.P. until about 1965. Thereafter, they should gradually decrease as compared with the G.N.P.

# SECTION III

# COMPETITIVE ELEMENTS IN THE TRANSPORTATION FIELD

## INTRODUCTION

In this part of the report it is proposed to review, in detail, the competitive position of the various modes of transportation available to the Canadian public for the movement of freight and passengers. As recited in the foreword of the report the specific term of reference which will be discussed reads as follows:

> "Competitive elements in the transportation field. This will deal with the various forms of competitive transportation services."

# 1

## THE CHANGING PATTERN OF COMPETITION

THE DEVELOPMENT of competition in the transportation field over the past quarter century has paralleled the pattern of competition to be found generally in industry today. Competition between substitute services (alternative carriers) has become as significant as competition between like carriers, just as competition between substitute products is now in many instances as important as competition between sellers of the same product. This new pattern has both strengthened and made more extensive the competitive structure of the transportation industry. This study is concerned principally with the competition between the different types of transportation services rather than between similar carriers competing directly with each other.

Within the short space of 25 years, three new carriers have become firmly established — motor carriers, airlines and pipelines. Highway transportation has emerged as one of the dominant features of commercial life, and the use of automobiles, buses and trucks continues to expand. A growing network of pipelines now provides a major distribution system, and water transportation has been stimulated by modern equipment and improved facilities. Air travel, both domestic and international, has developed very rapidly, and air freight provides a further addition to the transportation system.

In 1928 most of the country's transportation was done by railways and water carriers. There were no commercial airlines, no pipelines, few paved highways and motor trucks were small in numbers and size.

Compared with 1928, the thousands of miles of railways, paved high-
 ways, waterway, airline and pipeline facilities which exist today, together

with the equipment in use, present an imposing picture as shown in the following table:

TRANSPORTATION FACILITIES - 1953

| | Miles |
|---|---|
| Railways | 58,695 |
| Highways — surfaced | 203,828 |
| Airways — scheduled | 26,767 |
| Pipelines — petroleum | 3,794 |
| Inland waterways | 4,200 |
| Airports (number of units) | 433 |

TRANSPORTATION EQUIPMENT

| | Units |
|---|---|
| Railway locomotives | 4,818 |
| Railway freight cars | 187,980 |
| Railway passenger cars | 6,456 |
| Passenger automobiles | 2,514,000 |
| Motor trucks | 824,000 |
| Motor buses — intercity | 4,725 |
| " — urban | 3,290 |
| Aircraft — commercial | 1,363 |
| " — private | 1,151 |
| Vessels — inland waterways | 421 |

Competition, therefore, has risen from a position of comparative insignificance to a major consideration in the structure of the transportation industry. Railway monopoly, based upon technological conditions, has been virtually ended over an ever-widening area in transportation for as far as it is possible to see into the future. Indeed competition is likely to become much more intense over the next quarter of a century.

The various types of carriers comprising the transportation industry in 1956 offer many different kinds of services. Some of these are directly competitive, some are complementary to one another, and others are quite different from one another.

A further factor is the growing use of private transportation facilities. The operating flexibility of the motor vehicle has caused a tremendous growth in the number of private carriers (that is to say, carriers who haul their own goods in their own vehicles) and a substantial amount of private operation also exists in water transportation.

It is also true that various carriers offer their services under differing conditions — so much so that it is impossible to regard transportation as a homogeneous industry. Rather, it is more in the nature of a group of competing industries, composed of carriers which are completely diverse in their organizational and technical characteristics. The result is a very marked difference in the type of service, in some cases in the quality of service, and also in the costs of each carrier. In fact, the only thing they have in common is that they offer facilities for the movement of passengers and freight.

The growth of competition during the last 25 years has caused a marked shift in traffic between the several carriers. Within this changing picture, railways have been most affected. For example, in 1928 it is estimated that railways accounted for approximately 84% of Canada's total freight traffic ton-miles. By 1953 (as indicated in the table below) their share had dropped to 60.5%.

## ESTIMATED DISTRIBUTION OF INTERCITY REVENUE FREIGHT TON-MILES BY TYPE OF CARRIER FOR SELECTED YEARS

*(000,000 ton-miles)*

| Year | Rail | Water | CARRIER | | | |
|---|---|---|---|---|---|---|
| | | | Highway(2) | Air | Pipeline | Total |
| 1928..... | 41,846.8 | 8,067.8 | 49.7 | — | — | 49,964.3 |
| | 83.8% | 16.1% | 0.1% | — | — | 100.0% |
| 1936..... | 26,575.0 | 7,334.5 | 380.4 | 2.5 | — | 34,292.4 |
| | 77.5% | 21.4% | 1.1% | (1) | — | 100.0% |
| 1945..... | 63,645.7 | 18,336.2 | 3,437.4 | 3.4 | 400.0 | 85,822.7 |
| | 74.1% | 21.4% | 4.0% | (1) | 0.5% | 100.0% |
| 1949..... | 56,747.3 | 19,338.3 | 7,631.9 | 7.5 | 400.0 | 84,125.0 |
| | 67.5% | 23.0% | 9.0% | (1) | 0.5% | 100.0% |
| 1953..... | 65,825.3 | 21,897.2 | 14,185.4 | 23.7 | 6,816.6 | 108,748.2 |
| | 60.5% | 20.1% | 13.1% | (1) | 6.3% | 100.0% |

(1) Less than 0.5%.
(2) Private and common carriers.

The greatest gains in freight traffic have been made by motor carriers and pipelines. Motor carriers (both private and commercial) now account for approximately 13.1% of Canada's freight movement, and pipelines for 6.3%. Railways and water carriers combined still account for the largest percentage of the nation's freight movement, slightly more than 80%.

While railways have experienced the smallest relative growth in traffic, the absolute increase in freight ton-miles has been substantial. Between 1928 and 1953, for example, railway freight increased by close to 24 billion ton-miles. This increase has been largely due to the growth of Canada's basic industries for which low-cost rail transportation is the most economical form of movement where water services are unavailable.

2

## THE BACKGROUND OF COMPETITION

THE role which each type of carrier has played in the general transportation picture should be considered in the light of two factors — service and cost. Both stem directly from the technical and operating characteristics of each type of carrier. The remarkable growth of motor carriers and airlines is mainly due to three important characteristics — mobility, speed and the ability to penetrate into areas beyond the service limits of rail and water transport.

During the past quarter century, the Canadian economy has undergone a radical change, evolving from a largely agricultural economy to a highly industrial one characterized by the rapid growth of secondary manufacturing or light industry. Generally speaking, the finished products of these industries have a high value in relation to their raw material content and consequently the cost of moving the raw materials is only a small part of the total cost of production. Other costs such as finance charges, inventories, loss and damage, spoilage and loss of market value through fluctuating demand have assumed a much greater importance in total production costs. The significance of this, insofar as transportation is concerned, is that for an increasing number of shippers the quality of service has taken precedence over the cost of service.

Another characteristic of these light industries is that while relatively small amounts of raw materials are used, a large variety of components, including semi-finished products, enter into their production. Manufacturers, therefore, in an attempt to minimize cost are required to maintain inventories as low as possible without disrupting manufacturing processes. In some cases, incoming materials are off-loaded directly onto a production line.

Finally, the goods of light industries are usually sold in highly competitive markets and an important element of service accompanies their sale. Manufacturers and retailers must maintain intimate contact with the consumers in order to improve sales while at the same time keeping distribution cost to a minimum.

This combination of factors, therefore, has encouraged light industries to locate their factories near the principal markets in which their goods are sold. This in turn has given rise to a tremendous growth in freight traffic over distances which generally speaking vary from about 20 to 500 miles.

To meet the exacting requirements of light industries, transportation agencies have had to provide quick service, plus reliability and flexibility. The time between ordering an article and its delivery may be short and delivery schedules must be met. Failure to meet such schedules can affect plant operations and costs to an extent out of all proportion to any differential in the transportation charges of competing carriers. A low rate combined with a slower service could, under these circumstances, be much more expensive in terms of total production costs than a combination of a high rate and a faster service.

Even in the movement of finished goods there is the same sort of condition. Storage of many of these products may be difficult and expensive. Therefore, stocks of finished goods must be kept as low as possible in the interests of economy.

### *Highway and Motor Carriers* [1]

The rapid development of Canadian light industries has been one of the principal reasons for the growth of motor carrier operations, whose technical characteristics are ideally suited for the movement of shipments over short and medium distances on fast, regular and flexible schedules. The size of the trucks and tractor-trailer combinations, either for small consignments or larger consignments up to 20 tons, meets the requirements of many of the shippers who operate under conditions of close inventory control.

The need for increased frequency and speed has been met by motor carrier operations, since a motor vehicle can handle a much smaller load than a train, can make a quick turnaround, maintain fast delivery schedules, provide door-to-door delivery on a personalized basis and can be more economical through lower terminal costs as well as less rigid requirements for packing, crating, etc.

Another basic reason for the growth of motor carrier transportation is the continuous improvement in Canada's standard of living. Large increases in the consumption of fresh fruits and vegetables, meat and milk products, etc. have given rise to a demand for quick delivery from farm to market and from farm to railhead to reduce the possibility of spoilage.

Equally important is the ease with which industry can turn to the operation of its own motor vehicles. The growth of private trucking, as described earlier in Section I, has been one of the major changes in the pattern of transport competition in the past quarter century. Local distribution (that is to say within approximately a 30-mile radius of base) has represented the principal use of privately-owned trucks. However, between World War II and 1953 there has been an enormous growth in intercity

[1] See Appendix A for an appraisal of the motor carrier industry prepared by Mr. A. F. Hailey

hauling by private trucks. Particularly has this been the case with respect to companies whose operations are in different localities, each plant performing a specialized operation in the manufacturing of the end product, and for which transportation of both the raw materials and finished product is an integral part of the over-all production process.

By controlling their own transportation facilities, these companies or groups of companies can readily adjust their production and delivery requirements. Late closing or indirect routings of traffic are under their complete control. For this reason, the comparative cost of private vs. for-hire motor truck operations may well be secondary compared with the convenience (and occasionally the advertising value) associated with control of their own highway vehicles.

The rapid expansion (particularly since World War II) of highways, roads and streets has also contributed extensively to highway transportation. Motor carriers are able to operate almost anywhere a road exists. Canada's highways have increased not only in mileage but in quality, an even more important factor. Total mileage of surfaced and paved highways has gone up from 64,121 miles in 1928 to 203,828 in 1955. Paved highways alone have increased even more rapidly from 7,725 miles in 1928 to 39,390 in 1953. Schedule 7 gives annual highway mileages for the last quarter century.

### *Air Transportation*

The substantial increase in air freight traffic may also be traced, to a large extent, to the requirements of light industries. The products of these industries are frequently fragile, perishable and of high intrinsic value, and the speed of air service can mean savings in total costs which more than offset the initially higher transportation charges.

For commodities of high intrinsic value, and hence high retail value, the transportation cost component of the selling price is normally a much smaller percentage of total cost than are such items as insurance and finance charges. By reducing time in transit, air transportation has been able to compete effectively with railway express service and motor carrier service, at rates which are substantially higher than those of its competitors.

Also a factor in the growing use of air transportation by industry is the unpredictability of demand, plus a desire to give special service. A manufacturer who is faced with an emergency requirement for some part or component at a distant scene of operations may decide to make use of air freight as a means of customer service (sometimes at a direct loss to himself), hoping to recoup his loss or lessened profit in over-all business results.

However, for general cargo the fundamental disadvantage in air movement is its relative high cost. The present average cost of air cargo service for all Canadian air services is about 49 cents per ton-mile — a figure which

means that in normal circumstances air carriers can compete with surface carriers only where speed is the most important consideration.

A further disadvantage in air movement of general freight is the cost of handling cargo between the commercial districts of cities and airports, which in the case of a large city may mean a distance of up to 25 miles. With present high distribution costs this is an important consideration. The problem is also aggravated by the necessity of weighing cargo and its careful stowage, in accordance with a pre-arranged flight schedule which has to take into account weather conditions and other variables. Interline transfers involving physical handling of freight, owing to the considerable proportion of air shipments which originate or terminate at points which are not air terminals and therefore have to be further handled by other carriers, are also expensive and inconvenient.

In certain circumstances, of course, air freight is moved in large volume, the most obvious being in certain areas of northern Canada. Here, however, the question is one of necessity rather than cost, since no other form of transportation is available.

*Pipelines*

The expansion of pipelines has resulted directly from Canada's growing importance as a producer of petroleum, as well as an increased demand for oil products. Canadian oil producers, faced with the need for low-cost, reliable transportation to Canadian markets, have turned to pipelines because of their superior service characteristics and low cost for volume traffic (only slighty higher than that of water transportation). Water routes used for petroleum movement are often circuitous and seasonal in operation, or a combination of both.

Pipelines moreover, by providing year-round service, have done much to eliminate the heavy storage costs involved in the winter freezeup. Quality of service is again apparent in the development of this competitive form of transportation.

Other technical characteristics of pipeline operations which have been responsible for their growth include one-way movement of traffic which eliminates the cost involved in an empty back haul, automatic pumping processes which reduce manpower and labour costs, low maintenance costs because the right-of-way is narrow and the pipe is laid for the most part in rural areas, and a minimum of fire risk and evaporation as the facilities are underground.

Pipelines then, for volume movement of petroleum products, have proved to be a valuable addition to the nation's transportation resources and their importance will undoubtedly grow in keeping with the growth of Canada's population and production of oil products. Pipelines constitute, however, a highly specialized carrier, as they are part of an integrated industry.

### *Water and Rail Carriers*

For volume traffic movements railways and steamships are the principal Canadian freight carriers. Presently these two forms of transport combined carry some 80% of all freight ton-miles.

Some indication of the inherent economy of rail and water transportation for volume traffic is to be found in a comparison of the estimated average revenue per ton-mile for the various types of transportation. In Canada, it is estimated that to move one ton of freight traffic one mile on the Great Lakes would cost from 0.2 cents to 0.5 cents. On the railways the average would be 1.5 cents, in pipelines 0.3 cents and on airlines 49.0 cents. Motor carriers' estimates vary between 5.0 cents and 6.0 cents per ton-mile, although official information on this subject is not available.

The low average cost of rail and water carriers is directly attributable to the inherent technical characteristics of each carrier. The railways' predominance, for example, in providing transportation services for volume traffic stems directly from its efficient use of power, separation of motive power from carrying capacity and reduction of rolling resistance to a minimum. Not only do railways require a small amount of power per unit of transportation, but it is relatively cheap power to build and maintain in terms of the units of transportation provided.

The key to the railways' economy lies in the use of the train as the basic unit of conveyance. By separating motive power from carrying capacity and constructing cars of large capacity and standard design, the railways have achieved substantial flexibility and capitalized on the economies of large-scale operations. By combining vehicles in trains and setting up interchange operations with other railways, economy has been maintained in the movement of heavy loads without any sacrifice of distributive efficiency.

The railways offer a variety of services, such as stop-off privilege, reconsignment and conversion and limited free demurrage, but lack the flexibility offered by motor carrier door-to-door service. This, however, is likely to become available to a growing volume of traffic with further development of trailer-on-flat-car service. This might well be a partial answer to the time-consuming and costly rail terminal operations resulting from the loading and assembly of cars at a point of origin, reassembly at intermediate points, and disassembly and unloading at destination.

Water carriers, because of the size of the basic unit of conveyance and economy of power coupled with free water channels, remain the lowest cost carrier in the transportation industry. Of even greater significance water carriers, unlike the railroads, have been able to secure an increasing share of the nation's total freight traffic despite growing competition.

Two factors have done much to contribute to the successful operation of water carriers in recent years. First with the continuous growth in

Canada's production of minerals, petroleum, grain and lumber, large capacity vessels have been able to provide, in part at least, the low-cost transportation service required for successful marketing. Vessels of up to 25,000 tons capacity and of special design now ply the Great Lakes in the movement of these bulk commodities. Moreover, water carriers are readily adaptable to private operations, a significant proportion of the Great Lakes tonnage being of this nature.

The second factor is that the effectiveness of water transportation has been improved by motor carrier services which have placed an increasing number of shippers within easy reach of the waterways. By combining the low-cost water movement with the flexibility of motor carriers, shippers need no longer be situated on the water's edge to avail themselves of the service.

The deepening of the St. Lawrence Seaway, which will eliminate many of the problems associated with trans-shipment of freight, should do much to increase the efficiency and reduce the costs of water carriers. These factors lend confidence to expanding operations in the future, even though the new navigation facilities will not be toll free.

# 3

## AVERAGE COSTS OF TRANSPORTATION

THE other important factor bearing on the determination of the proper economic sphere of each transportation agency, apart from service, is cost. Usually, average cost comparisons suffice for this purpose, yet it must be realized that while such a comparison provides a general guide, average costs are made up of a large number of individual costs of particular shipments, and these vary widely. Hence, average costs can be misleading as a true criterion of the proper economic function of each carrier. For example, while the railways' average costs are about one quarter those of motor carriers, specific costs for moving individual shipments may exceed the particular costs of motor carriers for the same shipments. Important considerations in this respect are the length of haul, the size of shipment, the regularity of movement and the density of traffic along any given line. For short-haul movements in which terminal costs may be a relatively large proportion of total costs, the carrier with the smaller amount of terminal expense should have a cost advantage. Similarly where individual shipments are small, the size of the vehicle becomes an important consideration. Where traffic is of a sporadic nature, or where traffic along a particular route is light, then the carrier with the greatest flexibility to adjust its capacity rapidly to the nature of the traffic will enjoy a cost advantage.

While it may be possible to determine with some degree of accuracy the average cost of any carrier or any form of transportation given total ton-miles and total expenses, it is almost impossible to determine the full cost of individual traffic movements unless the volume is substantial and the pattern of movement well defined. The reason for this is to be found in the complexity of fixed, common and joint costs inherent within the cost structure of the transportation industry.[1] It is the influence of these costs, moreover, that gives rise to many transportation rate anomalies which are so distasteful to certain shippers, but which are perfectly sound from the standpoint of commercial rate-making and essential from the economic characteristics of the industry.

It is the presence of fixed costs, for example, which justifies the value of service principle in rate-making, although with the growth of competition the costs of competitive carriers have now become the practical ceiling. Common and joint costs which are incurred for traffic as a whole must also be recovered in accordance with the varying demands of individual shippers.

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1 See Appendix B for an appraisal of the cost structure of the transportation industry.

Pipelines have the largest proportion of fixed costs to total costs of any carrier, due to the interest and the depreciation charges necessary to service the heavy initial capital expenditures. As pipelines are in the nature of a specialized carrier serving a single commodity, however, there is no need to depart from the cost principle as a basis for rate-making. Railways, because of the large investment in track and structures, have a much larger proportion of fixed costs relative to highway, air and water carriers. Studies undertaken by the Interstate Commerce Commission in the United States in recent years have indicated that some 20% to 30% of railways' long run operating costs are fixed, exclusive of investment, compared to a maximum of 10% for motor carriers. Railways also have a larger proportion of common and joint costs than any of the other carriers have, because of the wide variety of services provided.

The effect of these various costs on carriers makes it almost impossible to determine with any degree of accuracy the cost of particular traffic movements. For purposes of competitive rate-making the best any carrier can do in the way of cost ascertainment is to ensure that its variable (direct) costs are covered in each situation and the fixed (indirect) costs are recovered in accordance with the wide range of demands of the shippers.

# 4

## ECONOMIC SPHERES OF OPERATION

FROM this brief review of the inherent service and cost characteristics of the various competitive carriers there emerges a reasonably clear picture of the type of traffic which each carrier might be expected to carry if the nation's transportation costs are to be kept at a minimum — which is perhaps the main objective of any sound transportation policy.

For volume movements of petroleum products between points where water facilities are not available or where they involve a circuitous routing, or are closed in the winter, pipelines represent the most economical form of transportation. For bulk movements of low rated commodities, without trans-shipment, between points linked by water facilities, water carriers have a marked cost advantage over all other carriers and are the most suitable form of transportation where speed is not important. For similar traffic moving between points where water facilities are non-existent, the economy of rail transport cannot be matched by other competitive carriers. For feeder services to other types of transport and for services where no other form of transport exists, there is a function natural to truck transportation. For general traffic movements of high rated commodities, there is a large market common to both rail and road transportation, the appropriate division of which will depend upon the location of shippers and consignees, the size of the shipment, the length of the haul and the carriers' direct costs. For specialized freight traffic movements of commodities of high intrinsic value, or of perishable or fragile characteristics, the speed of air transport makes it the most economic form of transportation, provided such a service is already in operation.

The present division of traffic between competitive carriers appears to conform closely to this pattern. The rapid growth of pipelines attests to the superiority of this carrier for volume movement of petroleum along routes where there are no water facilities, or where the navigation season is short. The fact that over 90% of traffic moving by water in Canada consists of grain, crude petroleum and products of the mines and forest, indicates that water carriers are performing the transportation function for which they are best suited. The relatively small amount of freight traffic moved by airlines is directly attributable to the availability of traffic suitable to air transport.

An important exception to the general pattern of conformity covers that portion of the transportation market which is competitive as between motor

carriers and railways, and where a considerable overlapping of functions exists. For much of the traffic there is no simple answer to the proper sphere of operation for each carrier. This can only be determined by the free choice of the shipper for the services of one or other of the carriers. It is possible, however, to break this common market down into two distinctly different types of movement. First, traffic for which both the shipper and consignee are located on a railway siding, (i.e. siding-to-siding railway traffic); and traffic which involves motor carrier handling at some stage of the transportation movement.

For short hauls and some medium hauls, motor carriers will have a cost advantage because of their lower terminals costs, faster schedule and door-to-door service. For longer hauls the higher terminal handling costs of the railways are generally more than offset by the savings resulting from lower line haul costs, and line haul speed offsets delays in terminals.

For particular traffic movements, therefore, the role of railways and trucks will be determined by their respective long run out-of-pocket costs combined with their service characteristics.

To what extent service outweighs cost considerations in today's competitive road-rail market cannot be decided exactly. Only shippers with a free choice between alternative carriers can weigh the relative merits of cost and service for their particular transportation requirements.

# 5

## AN APPRAISAL OF THE EFFECTS OF COMPETITION

The growth of competition within the transportation industry has had many favourable effects. Shippers have benefited generally from the wide range of new services made available, from the substantial improvements in existing services and in many cases, from the lower costs which have resulted directly from the new conditions of competition. Industrial decentralization has been accentuated and extended while the country as a whole has benefited from the greatly expanded transportation capacity which has matched the rapid rate of economic growth.

The impact of competition, however, has not been without problems for certain types of traffic and carriers. Two of the new competitive forms of transportation, airlines and motor carriers, may be called high-cost carriers, in the sense that the services offered are suited primarily to commodities of relatively high value. The third, pipelines, while low cost carriers, are highly specialized in function, serving a single commodity.

The effect of this has been to aggravate the problems of the older carriers, particularly the railways. While railways have participated in the growth of traffic in recent years, their share of the total transportation market has steadily declined. Of even greater significance, the railway portion of total revenues has fallen even more precipitously.

The reason for this is that revenues earned from high rated commodities have in the past provided a large proportion of railway overhead costs. With the loss of this traffic, the railways are being required to recover a larger proportion of overhead cost from lower rated commodities, or traffic of the basic industries, which includes virtually the entire export market. The inexorable result must be to increase the cost of transportation for low rated commodities.

Although these developments may be discomforting to the railways, diversion of some traffic from the older to the newer forms of transportation must be expected. This diversion, moreover, should not be discouraged provided it represents the substitution of a more efficient form of transportation, the ultimate objective of a competitive transportation system. Given equality of competitive opportunity for all carriers, the most efficient carrier in terms of costs and service should move the traffic.

In three important respects, however, the railways are handicapped by existing competitive conditions.

a) Railway rates, unlike those of their competitors, are to a great extent influenced by considerations of national policy to the detriment of the railways' commercial requirements in a highly competitive transportation market.

b) Regulation is more restrictive for railways than for other carriers and, more important, is becoming more onerous with the growth of competition.

c) Railway rates *in toto* like those of pipelines must reflect total costs of operation, whereas the rates of other carriers need do so only in varying degrees as part of the facilities used are provided by various levels of government.

### *Railway Rates*

For a proper appreciation of the difficulties the railways are experiencing in adjusting rates to the requirements of competitive traffic, it is necessary to look beneath the symptoms of the problem.

Railway rate policy from the beginning has been strongly influenced by national considerations or by the need to promote the widest possible development of markets by reducing, insofar as possible, natural geographic disadvantages. To the extent that railway rates have achieved this objective, they have encouraged the growth of low rated export traffic as well as extended the benefits of settlement and development to remote areas, thereby broadening the base of the national economy in a way which has been both beneficial to the railway industry and the nation at large.

Because of the cost structure of the industry and the wide differences in the value of service to shippers, railways have employed an extreme form of differential charges, ranging from as low as 0.5 cents per ton-mile to as high as 20 cents per ton-mile. Minimum rates have been based on long-run out-of-pocket costs, and maximum rates on the value of the services to the shipper. Stating the principle in another way, the industry's overhead costs have been collected unequally from different types of traffic in accordance with the demand for railway service.

Individual rates for railway transportation, therefore, have had very little relationship to the cost of performing individual services. Only in the sum total of revenues and expenses do rates and costs bear a reasonable relationship to each other. But total railway costs must be covered by total revenues; therefore it follows that if the rates for certain services are less than full costs, the rates for other services must be above such costs; hence

the practice which is generally referred to as internal subsidization. The result is that a disproportionately large segment of railway overhead costs is being recovered from high rated commodities which are a small proportion of total railway freight traffic. For example, the C.P.R. stated before Mr. Justice Sloan that in 1952, 85% of its overhead costs were recovered from 30% of its traffic.

The railways' attempt to spread transportation costs equitably over all traffic by the use of the value-of-service principle of rate-making has invited competition as much on the basis of rates as on the basis of competitive carriers' costs and service. For this reason an increasing number of shippers have been turning to alternative carriers or providing their own services at costs which are below the railways' rates, but frequently above the railways' true costs of operation.

A second way in which railway rates have reflected national considerations is by charging the same rate on all lines regardless of any differences in costs which may exist. In this way railway rates have promoted the development of many remote areas, as well as a uniform growth of the country's economy inasmuch as light traffic lines have enjoyed the same rates as heavy density lines.

The C.N.R. submission to the Royal Commission on Transportation, 1951, indicated that about 25% of mileage failed to contribute anything to overhead costs while an additional 30% was considered to be marginal. Therefore, virtually all of their over-head costs appear to be recovered from the remaining 45% of operations.

This characteristic of the railway rate structure requires the railways to recover a high proportion of overhead costs from high density lines where costs are low, and is in effect a further application of the principle of internal subsidization. This situation does not prevail to the same extent for pipelines, water carriers, airlines and motor carriers.

A third way in which the railway rate structure has been affected by national policy considerations, has to do with the equalization of class rates. Over the years there have been variations in regional railway class rates reflecting differences in railway costs of operation or demand for railway services. Such considerations no longer have any application to railway rates as a uniform class rate structure is applicable to the whole of Canada, with the exception of the Maritime Provinces. Such losses as may be incurred in any one region because of higher operating costs must therefore be recovered from profits in other regions, and if in the process certain railway rates have to be maintained at an artificially high level, traffic thereunder must become progressively more vulnerable to competitive carriers which have no obligations to adopt a similar type of charging.

Finally, superimposed on these three forms of internal subsidization are fixed statutory rates on export grain traffic from western Canada. This traffic which normally accounts for approximately 30% of the two major railways' total revenue freight ton-miles is moved at rates (0.5 cents per ton-mile) which are claimed by the railways to be very close to their short-run out-of-pocket costs. This means that the entire overhead cost attributable to the movement of export grain from western Canada has to be recovered from other traffic. The transference of this overhead expense to other-than-grain traffic, much of which is highly competitive, improves the competitive position of other carriers and correspondingly weakens the competitive ability of the railways.

The principle of internal subsidy now permeates the whole railway rate structure, not only as it affects different types of commodities, but also as it affects different lines and regions. General transportation rate-making, because of the influence of fixed, common and joint costs, will always require some degree of internal subsidization. This is particularly true of railways because of the scale of operations and the need for a practical rate structure. However, the extreme application of the principle, for reasons of national policy, is proper only for carriers which enjoy a high degree of monopoly and can be regulated as such — not to a single carrier in a highly competitive industry. These public obligations which for more than a half century have been either expected or required of railways as a *quid pro quo* for their monopoly, are no longer appropriate to the new conditions of competition within the transportation industry, and cannot help but create unequal conditions of competition between the railways and other carriers.

In considering the cost structure of the various carriers, it was observed that railways, because of the relatively large proportion of expenses which are in the nature of fixed, joint and common costs, should enjoy considerable flexibility in competitive rate-making. In practice, however, much of this flexibility has been eroded. Faced with growing competition on every side, railways find themselves confined within narrow limits in making necessary rate adjustments on competitive traffic because of the inadequacy of contributions to overhead costs from a large proportion of traffic in the non-competitive field.

The growth of competitive rates and agreed charges, as well as the progressive abandonment of unprofitable services, where permitted, are clear indications of the railways' recognition of the true nature of the problem and of their efforts to meet it. However, because a redistribution of overhead costs between different classes of traffic is involved, these adjustments are usually resisted. For this reason the process of adjustment to competitive requirements is likely to be gradual.

There may well be sound justification in a country such as Canada, characterized by small population, by vast distances over which commodities move to markets, and by a high dependence on exports of relatively low

rated commodities of primary industries, for national policy to hold transportation costs on certain traffic at a minimum. It may also be true that diversification of industrial production is necessary in those areas of the country where opportunities for employment other than in primary industries are limited. Also in the interest of a uniform development of the country, special assistance may have to be given to remote areas in the form of reduced transportation costs. Nevertheless these objectives, however desirable they may be, are becoming more and more difficult to achieve through railway rates, owing to the loss of the monopoly position of the railways over much of the nation's traffic. Further attempts to do so can only result in a progressive weakening of the railways' ability to compete effectively with other carriers. Railway internal subsidization as an instrument of national policy, is no longer appropriate to today's competitive transportation conditions. Some alternative method will have to be found to achieve this objective if the railways are to adjust themselves effectively to the new competitive conditions and if equality of competitive opportunity for each carrier is to be meaningful.

*Regulation*

All carriers are regulated in varying degrees by either the federal or provincial governments. The federal government, through the Board of Transport Commissioners and the Air Transport Board, exercises partial or complete jurisdiction over pipelines, airlines, water carriers and railways, while motor carriers are under provincial jurisdiction.

With the exception of certain water services, carriers are required to prove public convenience and necessity to obtain an operating licence. Insofar as scheduled air lines are concerned government policy has been to limit operating rights along specified routes to a single carrier in the interests of the lowest cost service to the public. The licensing of pipelines has also reserved particular route operations to a single carrier. On the Great Lakes and the Mackenzie River system, carriers are licensed by the Board of Transport Commissioners. Control of capacity in water transportation, however, is made difficult by the relative ease with which one can become a private carrier.

Federal carriers also require authority, under the Railway Act or the Aeronautics Act, to abandon services. In practice this has proved more difficult for railways than for other carriers, and is a fundamental problem of the railway industry. The public interest involved, moreover, could in many cases be adequately served by newer forms of transportation and at lower costs. In recent years the Board of Transport Commissioners has shown an acute awareness of the seriousness of this problem and has been more willing to approve service abandonments.

Insofar as motor carrier services are concerned there is little uniformity in licensing policy. Only five of the ten provinces require proof of public

convenience and necessity in granting operating licences, and there are major differences in the degree of control exercised by each.[1] In some provinces, for example, railway applications to substitute motor carrier service for rail service, or to provide a co-ordinated road-rail service, have been considered on their merits. In others there is almost a complete prohibition against a rail-operated highway service. This type of restriction can only result in inferior service and increased national transportation costs.

For a competitive atmosphere to exist in the transportation industry there should be an opportunity for carriers to extend their activities in new directions. Competition does not necessarily entail a situation where a number of firms do in fact provide rival facilities. The large-scale trend towards product diversification in modern business is ample testimony to this fact.

Federal rate regulation of airlines, pipelines and railways is similar in a number of respects. Each carrier must file and publish rates and these must be the same for all shippers. Within this framework, pipelines and air lines may freely adjust rates to meet commercial requirements whereas railways are subject to a number of additional requirements with respect to competitive and non-competitive traffic.

Water carriers in the coasting trade are free from any form of rate regulation as they are also with respect to licensing. The rates of lake carriers are subject to Board of Transport control for package freight only, bulk traffic (over 90% of total) being completely free from regulation. Carriers on the Mackenzie River system are subject to precisely the same form of rate regulation under the Board of Transport as are airlines.

As for motor carriers, only two provincial governments have seriously attempted to control intra-provincial motor carrier rates, and only one regulates the rate of interprovincial and international highway traffic under the authority delegated by Parliament in 1954.

Railway rates are not only subject to control by the Board of Transport Commissioners but also by Parliament through statutory rate provisions. With the single exception of legislation in 1955 on agreed charges the trend in railway rate regulation since the end of World War II as evidenced by the Railway Act has been towards greater rigidity at a time when the rapid growth of competition might have suggested some relaxation of regulatory control. Increased railway rate regulation has in part been the direct result of the growth in competition. The reason for this paradox is to be found in the fact that as the loss of competitive traffic has required the railways to recover more of their overhead costs from non-competitive traffic, new controls over both competitive and non-competitive traffic

[1] See Appendix A for a more detailed consideration of provincial regulation of motor carrier services.

have found their way into the Railway Act in such a way as to limit further railway management's commercial discretion over rates.

Since the end of the war, the Board of Transport in general revenue hearings appears to have been strongly influenced by new criteria in adjusting reasonableness of rates. Formerly, applications by the railways were considered solely with regard to the reasonableness of the proposed rate increases from the standpoint of the revenue requirements of the carrier. Since the end of the war, however, the growing sensitivity of the regulatory authority to the elasticity of demand for railway services, to the basic theory of business cycles, and to the direction and intensity of inflationary forces has become an equally important consideration.

The present discrepancy between railway prosperity and that of business in general has given rise to an important problem of public policy. For if the railways are not to be permitted to realize reasonably high earnings in the midst of general economic prosperity, their prospects for continued financial stability are indeed in jeopardy.

Turning from regulation of the general level of rates to the control of particular rates, amendments to the Railway Act in the postwar period have tended to limit both the Board of Transport Commissioners' discretion over rate adjustments as well as the freedom of the railways in a number of respects. For example, control of transcontinental competitive rates, competitive rates and class rates in general is now provided by statute. The railways in their submissions to the Royal Commission alleged that the effect of regulatory developments in recent years has been to limit their ability to compete effectively with the newer forms of transportation. The submission of the Canadian Trucking Association on the other hand took exactly the opposite view.

In attempting to reconcile the opposing views of the two carriers, much thought has been given to the respective submissions and additional information has been developed from other authoritative sources.

There appears to be little evidence that the Board of Transport has been disposed to curb the railways' efforts to meet effectively the competition of motor carriers. Indeed, as mentioned earlier, the Board has shown an acute awareness of the railways' competitive requirements and has cooperated to this end.

Then too, Parliament in its legislation with respect to the use of agreed charges, recognized the railways' need for this type of competitive rate-making. As a result of the recommendations of the Turgeon Commission on Agreed Charges, an amendment to the Transport Act in 1955 gave the railways greater freedom in their use of agreed charges, which now automatically become effective after 20 days' notice and without the prior approval of the Board. The Minister of Transport, however, on complaint by either shippers or other carriers has the authority to refer any agreed charge

to the Board for its consideration. Motor carriers, moreover, have now the right to lodge a complaint with the Minister, a limited right they previously did not enjoy.

Amendments to the Railway Act, however, have increased railway rate regulation and further limited the railways' commercial freedom. Section 334, added to the Railway Act in 1951, empowers the Board of Transport to seek from the railways a large amount of detailed information in justification of proposed competitive rates. The present Board has permitted the railways a large measure of freedom under this section. However, it does constitute a potential restriction of some importance. The section provides, moreover, that a competitive rate can only be established to meet actual, not potential competition, with the result that in practice the railways cannot quote a competitive rate until competition has already been established and some traffic has been lost.

The transcontinental 1-1/3 rule also affects the railways' freedom but for a different reason. Under this regulatory provision railways are required by statute to extend the effects of water competition at Pacific Coast points to intermediate points where such competition does not exist. The favourable position in which the Pacific Coast finds itself is not one which has been created by the railways, but rather by domestic and foreign water carriers, and to a lesser extent by United States railways. Canada's railways under these circumstances would seem to have no alternative but to adjust their rates as best they can to the competitive situation or lose the traffic.

In practice the full effect of this regulatory provision has been lessened through the use of agreed charges. All traffic however, is not suitable to this type of rate-making.

The briefs of the railways and of the trucking industry clearly indicate that there is a basic difference in the views of the two groups as to the nature of the problem of competitive pricing. The trucking industry appears to regard such railway obligations as statutory rates, operation of unprofitable branch lines and statutory provisions regarding class rates and competitive rates as being completely unrelated to the railways' competitive position. The railways on the other hand are equally convinced that these statutory obligations, which have been increasing since the postwar period, have a direct and important bearing on their ability to compete effectively with other carriers.

There is also another aspect of the comparative freedom of railways and motor carriers which cannot be overlooked. Railway rates must be filed, published, strictly adhered to, and be the same for all shippers. These are obligations which have long been required of the railways under the Railway Act. In the case of motor carriers, on the other hand, only two provinces have effective rate regulation of intra-provincial rates and none has rate

regulation of interprovincial and international traffic. Motor carriers, therefore, are in general perfectly free to adjust their competitive and contract rates at will without publication, and if so disposed, to charge different rates to different shippers in accordance with the varying conditions of competition to be met. The railways are thus faced with the double handicap of having to make their rates known to their competitors while being denied knowledge of those of their competitors; and of having to extend them equally to all shippers, an obligation not required of motor carriers. This appears to be at the root of the railways' complaint that motor carriers enjoy a preferred position in the competitive transportation market vis-à-vis the railways.

The submissions of the two major railways urged the maximum of freedom in meeting competition so as to permit them to maximize their net earnings from competitive traffic. In doing so they drew a clear distinction between competitive and non-competitive traffic, and alleged that if they were allowed to meet their competition at rates which are higher than their out-of-pocket costs it should be in the interest not only of the railways themselves but also in the public interest and, more important, in the best interests of non-competitive traffic because any amount the railways recovered as a contribution to overhead costs from competitive traffic would necessarily be in relief of the rates of shippers of non-competitive traffic.

The solution to the problem of equality of competitive opportunity, in the opinion of one major railway, lies in a substantial relaxation of regulation of railways and in a policy of fair and minimum regulation for the transportation industry as a whole. All carriers should be required to publish their rates, strictly adhere to them, and apply them equally to all shippers insofar as conditions of competition will permit. Under such conditions all forms of transportation would be competing under essentially the same statutory rate obligations. Shippers would be protected against unjust discrimination by the forces of competition and the provisions of the Railway Act. The other major railway suggested that insofar as competitive traffic is concerned a large measure of equality in competition would be achieved if the railways were given freedom to set rates on ordinary commercial principles of pricing, subject to the dual requirement that rates be published and be remunerative in terms of their out-of-pocket costs. All other competitive carriers should be required to publish their rates. Shippers would be protected through knowledge of the rates of all carriers and freedom to shift their patronage freely between alternative carriers.

Before this Royal Commission, the railways were not the only witnesses to suggest increased freedom in transportation pricing policy. Similar thoughts were expressed in the briefs of the Canadian Manufacturers' Association, of the Province of Manitoba and of the Canadian Industrial Traffic League. On the other hand, the submission of the Maritime Transportation Commission cautioned against increased freedom in the railways' pricing policy.

For the maintenance of a national transportation system adequate for Canada's expanding economy and in recognition of the tremendous growth of carrier competition it would seem essential to place greater reliance on competitive forces in transportation pricing. This would not only speed up technical innovations but also assure the public of the lowest possible transportation costs.

*Government Assistance*

Government assistance has always played an important role in the development of Canada's transportation system. Perhaps the most important assistance given were the loans, subsidies and land grants paid to the railroads during the latter part of the 19th century. All carriers now benefit in varying degrees from government assistance. In considering governmental promotion of transportation two basic problems should be examined: First the proportion of total transportation costs financed by government relative to that paid by direct users; and second, the possible effect of government assistance on the conditions of competition in the transportation industry.

During the year 1953 government net assistance, as shown in Schedule 1 to 5, totalled $341,016,000 distributed among the different forms of transportation as follows:

| Type of Transportation | Amount | Percentage |
|---|---|---|
| Air | $ 31,255,000 | 9.1 |
| Highway | 179,000,000 | 52.5 |
| Rail | 60,590,000 | 17.8 |
| Water | 70,171,000 | 20.6 |
| All Carriers | $341,016,000 | 100.0 |

Net government expenditures on transportation in 1953 were approximately 3½ times the 1945 level and more than four times what they were in 1928. Yet this assistance amounted to only 4.7% of total transportation costs, and was with the exception of 1945, the lowest of any in the years selected for this study.

The effect of government assistance on competition is a more complex and important problem. A review of the activities of government in the provision of transportation facilities and services shows that government has played a vital role in the development and growth of competitive transportation. Highway improvement and modernization has been undertaken on a vast scale. Airport and airway facilities have been extended substantially to accommodate the rapid growth of air travel. Dredging on the St. Lawrence and the building of new docks, new wharves, etc. were undertaken every year. Certain developmental rail extensions have been constructed, with government aid, in areas where traffic was inadequate to justify service on a commercial basis.

Such government promotion has been rewarded by solid accomplishments, not only in terms of physical facilities and services, but also in the furtherance of broad economic objectives. The capacity and quality of Canadian transportation facilities far surpass those of most other countries.

It is not enough, however, simply to have a good transportation system. The objective should be to achieve the best system at the lowest national cost. The results of certain government promotional activity, examined from this point of view, indicate that, despite the many accomplishments, this desirable goal has not always been achieved. Benefits have often been confined to special groups to the detriment of others and, more important, the benefits have frequently been enjoyed by those who least require them. Assistance to one group, moreover, frequently leads to the need for assistance to others. A striking illustration was pointed out in the 1956 Report of the Ontario Select Committee on Toll Roads where it was observed that expenditures made to facilitate the movement of vehicles in urban areas frequently lead to increased fares on public transit. This type of promotional activity, therefore, may have adverse consequences for a large group and may give rise to demands for subsidy to urban public transportation.

The same situation prevails in intercity transportation. Airlines and motor carriers whose rates fail to reflect total costs are thus able to divert profitable traffic from railways, causing the latter to recoup overhead from traffic which of its nature is neither physically attractive to other carriers nor financially able to bear the cost. This in turn creates a need for assistance to low rated traffic which cannot pay a commercial rate; or for subsidies to certain areas; or for assistance in the construction of developmental services which formerly the railways were able to build with their own resources.

If competition between carriers is not to be distorted, and if traffic is to be allocated among carriers on the basis of relative cost and service, then rates of all carriers should cover the full costs of operation. These costs, moreover, must include not only the operating costs, but also the capital, maintenance and administrative costs incurred in providing and maintaining the physical facilities and service. For if private enterprise in transportation is to be preserved, and public enterprise maintained at a minimum cost, a formula must be found whereby the principle of user support could be applied uniformly to all forms of competitive transportation.

The degree to which government participates in the provision of transportation facilities may possibly have a more pronounced influence on how traffiic will move than the carriers' own ability to attract traffic at rates which cover all elements of cost. Shippers are interested only in the comparative rates of the carriers and not costs. Traffic moving under these conditions often tends to be distributed between carriers on a basis of artificial economic standards. For a rate may be compensatory to a carrier and still fail to cover the full cost of that service, if general taxpayers rather than the shippers are bearing a proportion of the cost of providing and maintaining the facilities in use.

Schedule 8 shows that the railways' right-of-way expenditures make up some 20% of total costs and these costs must be recovered in full through rates. Similar costs for motor carriers, as indicated in Schedule 9 are approximately 7%. At present there is no charge for the use of improved waterways. Because of the difference in the technical characteristics of each carrier it is not to be expected that these costs would ever be found to represent the same proportion of each carrier's total costs. Motor carriers and airlines, for example, have an inherent advantage in that they share with others in the use of facilities provided by government. Therefore the costs are distributed over a variety of users. The share of these costs which should properly be borne by the carriers might well be less, therefore than the equivalent cost of other carriers who provide their own facilities. This must be recognized as an inherent advantage enjoyed by these carriers, but unless the full share of such costs is assessed, then the economic advantage is that much greater, and the most productive use of the nation's transportation resources will not be realized. Shifts in traffic which result not from cost or service advantages, but from extensive tax supported facilities are truly uneconomic in the sense that traffic may be diverted to carriers whose rates are lower, but where real costs are higher. Transportation facilities provided from public funds should be financed to as large an extent as possible by the direct users of the facilities. An example of this is the new St. Lawrence Seaway where tolls will be charged over the next 50 years.

An important consideration bearing on the conditions of competition as between road and rail transport insofar as government aid is concerned has to do with the share of road and street expenditures paid by highway users, particularly that segment of the highway transportation industry which is directly competitive with the railroads.

The provision of roads and streets is very largely the responsibility of provincial and municipal governments. These expenditures have increased enormously over the past decade due to the inflationary rise in road construction and maintenance costs and the much higher standard of facility now being built.

The average annual expenditure on roads and streets in the 30's was approximately $83 million increasing fourfold in the decade since the war, to $343 million. Future expenditures on roads will probably be even much greater. The Canadian Trucking Associations' submission estimated that annual expenditures will amount to approximately $1,000 million by 1960.

Annual road construction and maintenance costs have increased by over 100% since 1940 while motor vehicles taxes have gone up by a much smaller amount. With the exception of the Province of Ontario, licence fees have remained at their prewar level. Gasoline taxes have risen, on an average, by approximately 40% since the war.

A considerable amount has been written on the subject of whether highway users paid their full share of the construction and maintenance costs

of streets and roads and no final answer has been found which is acceptable to all interested groups. An estimate of the share of road expenditures being met by the user was provided by the Canadian Tax Foundation in *Taxes and Traffic*, June 1955. In the introductory summary the Foundation states:

> One of the most important inferences that can be drawn from available information, however, is that the present level of user charges in most provinces is inadequate. In 1953 the ratio of user revenues to total road, street and highway expenditure for all of Canada was 59 per cent. The motorist in 1953 was paying about three-quarters of the proportion of total costs allocated to him under most formulae, and it is hardly likely that this ratio has increased in the meantime. While there is a great deal of variation among provinces it is apparent that if recent experience is indicative of the long-range position some increase in user charges is due in every province.

Shortly after the Canadian Trucking Associations presented its submission to the Royal Commission, the Report of the Ontario Select Committees on Toll Roads was made public. On the question of the adequacy of present highway revenues for road and street requirements the report stated (pp. 15-16):

> Schedule 'A-1' shows Ontario's deficit position to 1955 of $136,780,-000, when costs of construction and maintenance of highway are compared to revenues. Schedule 'A-2' adds the cost of interest at 4½%, Ontario's average interest cost over the long term, and shows our cumulative deficit to be $445,913,000. This schedule is most significant, and shows that revenues only exceeded expenditures in the years 1933 and 1937...

and on page 26 it was further stated:

> An analysis of highway expenditures and revenues shows that the present system of road taxation is not producing sufficient revenue to provide required roads. (See Table VI). If the province is to continue its assistance to municipalities through grants and, at the same time, meet demands for additional highways, rural and development roads, then new sources of revenues are required. (See Appendix B.)

The relationship between highway revenues and expenses, however, is only a guide as to whether different types of motor vehicles are paying adequately for the use of road and street facilities. Revenues might very well equal expenditures, yet because of the basis of taxation, certain types of vehicles could be subsidizing others. The more complex problem, therefore, is the proportion of highway taxes which should be equitably recovered from the various groups of vehicles.

On this point, the submission of the Canadian Trucking Associations states, "there is not in existence today in Canada any scientific formula for

allocation of road costs to the different user classes." The Canadian Tax Foundation's study suggests that this problem may be approached in one of two ways — the ton-mile method of cost allocation or the incremental method.

An incremental cost allocation study requires much engineering data not available for this report. It is possible, however, to make a ton-mile study of the problem. For this purpose seven classes of vehicles, by weight groups, ranging from 3,500 pounds up to the maximum gross weight allowed for each province, were selected. To these were applied an average annual mileage to derive the annual gross ton-miles performed. The annual taxes (gas and fees) paid by each class of vehicle were then divided by ton-miles to obtain the ton-mile tax contribution for each class of vehicle. The results, as shown in Schedule 10, indicate that on a ton-mile basis, passenger cars pay from a low of 3.2 times as much as do heavy gasoline powered vehicles in Saskatchewan to a high of 4.8 times as much in British Columbia. Light commercial vehicles pay from 3.3 to 5.3 times as much as heavy gasoline powered commercial vehicles in Manitoba and Quebec respectively.

A similar comparison with heavy diesel powered commercial vehicles is even more revealing, reflecting greater fuel economy. Passenger cars pay from 3.7 times as much in Manitoba to a high of 6.3 times as much in British Columbia, while light commercial vehicles pay from a low of 4.0 times as much in Manitoba to a high of 6.9 times as much in Quebec.

It is debatable, of course, whether or not the weight and mileage relationship between a private passenger car and a transport truck is an equitable basis for tax computation, but certainly the data points to a need for sound research on the problem in the interests of equity in highway finance and in the conditions of competition in the transportation industry.

If economic considerations are to serve as a guide to national transportation development, and a determinant of the proper function of each carrier in a properly co-ordinated system of transportation, the principle of user charges adequate to cover the carriers' cost of publicly provided facilities should be uniformly applied to all forms of transportation.

# 6

## COMPETITION IN THE PASSENGER FIELD

WHILE the growth of competition in freight traffic has resulted in a marked shift to new carriers, there has also been a radical change in the travel pattern of passenger traffic. Even as far back as 1928 the private car had cut deeply into the passenger market with rail and bus travel combined accounting for only 40%. By 1953 this had dropped to less than 20%, as indicated in the table below. During the war years, with gasoline rationing, and abnormally heavy civilian and troop traffic, railways again performed close to 50% of all passenger miles in 1945. But since the war, the private motor vehicle has again outstripped public carriers. Rail passenger travel in 1953 almost equalled the peak prewar year of 1928, but passenger miles of the private car were more than four times greater than in 1928. Both rail and bus travel have remained relatively constant over the past decade. Air travel has increased rapidly, but it still amounts to only about one-quarter of total rail travel, excluding commutation, and approximately 3.0% of total commercial intercity passenger travel.

### ESTIMATED DISTRIBUTION OF INTERCITY PASSENGER-MILES BY TYPE OF CARRIER FOR SELECTED YEARS

*(000,000 passenger-miles)*

| Year | Private Car(1) | Rail(2) | Bus(3) | Air(4) | Total |
|---|---|---|---|---|---|
| 1928..... | 4,886 | 3,141 | 179 | N.A. | 8,206 |
| | 59.5% | 38.3% | 2.2% | — % | 100.0% |
| 1936..... | 6,041 | 1,726 | 377 | N.A. | 8,144 |
| | 74.2% | 21.2% | 4.6% | — % | 100.0% |
| 1945..... | 5,742 | 6,380 | 1,008 | 132 | 13,262 |
| | 43.3% | 48.1% | 7.6% | 1.0% | 100.0% |
| 1949..... | 10,812 | 3,097 | 1,730 | 377 | 16,016 |
| | 67.5% | 19.3% | 10.8% | 2.4% | 100.0% |
| 1953..... | 20,110 | 2,882 | 1,817 | 744 | 25,553 |
| | 78.7% | 11.3% | 7.1% | 2.9% | 100.0% |

(1) Estimated.

(2) Steam Railways, D.B.S. (Commuter Traffic Excluded 1949-53).

(3) Estimated.

(4) Canada Year Book—Civil Aviation, Revenue Scheduled and non-scheduled flights only.

The revolutionary effect of the automobile on the pattern of passenger travel over the past quarter century has resulted in a more profound change

in social travel than has the introduction of any other new form of transportation. For the country as a whole, automobile registrations have increased from 930,619 in 1928 to 2,513,754 in 1953 or by 180%, and there were 1,323,733 more cars on the road in 1953 than in 1939, the peak prewar year, representing an increase of 111%. Automobile ownership has been increasing at a much more rapid rate than population. From 1928 to 1953 automobile registrations increased by 180%, population by 50%. In 1953 there was one car for every 5.7 persons compared with one for every 10.3 persons in 1928. Approximately 60% of all households in 1953 owned at least one car and 5% two or more. Automobile ownership, like population, is heavily concentrated in a few of the larger provinces. Ontario, Quebec and British Columbia, with 70% of Canada's population, are responsible for 72% of all automobile registrations.

A number of factors have brought about this tremendous expansion in automobile ownership and use. The most important has been a progressively increasing standard of living and the accompanying increase in leisure time. In effect the five-day week has meant 52 additional holidays for many.

The rapid growth in urban automobile use, which has exceeded that of intercity use, has been a product of the rapid development of suburban living which has meant a profound change in the pattern of urban living. Private transportation to and from work has been supplemented by automobile travel for shopping and other household duties, which in a growing number of cases has given rise to multiple car ownership.

Automobile ownership has closely paralleled the growth of the G.N.P. and outpaced the growth of population, as evident from Schedule 11.

In recent years, intercity passenger travel by private car has grown to approximately four times the volume of public transportation. While the automobile has cut deeply into rail and bus traffic, it has to a much larger extent generated new traffic.

The automobile is used principally for short trips, but an increasing proportion of longer intercity trips are also being made by car, particularly for vacation purposes. For intercity travel the automobile has greater flexibility and even greater economy under certain circumstances. The tourist chooses the automobile because it is available at his destination for local transportation use. The capacity and convenience of the private car for luggage, children and miscellaneous family belongings, moreover, cannot be approached by other competitive forms of transportation. The commercial traveller prefers the automobile because it enables him to go any place in his territory where sales have to be made in addition to furnishing the space required for samples and goods. Finally, driving a car is still for many people a source of pleasure and owning a car, however unwise economically, is still considered a matter of social prestige.

Economy of the automobile where several persons are travelling becomes an additional attraction. The average passenger mile cost for single occupancy of a new car, approximately 10 cents, is high when compared with bus, rail and even air travel which average about 2.5 cents, 3 cents and 6 cents respectively. A cost of 10 cents per passenger mile, moreover, is high for most automobile owners. Those who purchase a second-hand car are able to escape the full impact of the high price of new cars, and their operating costs are lower accordingly. Even more important is the fact that direct costs of automobile travel may be even lower than the total costs indicated above. Once a car has been purchased, licensed and insured, operating costs are generally considered by the owner as a marginal cost only — the extra cost incurred to make the specific trip possible. Frequently the owner looks upon the cost as including only gas, oil and operating repairs which may be less than half of the real cost.

The growth of the public bus may be directly traced to economy and convenience. Bus fares are generally lower than rail fares and, because of the size of the vehicle, service is more frequent. The frequency of stops also gives it a service advantage over railways for traffic originating at points between railway stations. Despite the growth of bus travel the private automobile has had an equal if not greater effect on bus transportation than rail. In recent years there has been little growth in intercity bus travel as indicated in the table below:

## REVENUE AND ESTIMATED PASSENGER MILES
## INTERCITY AND RURAL BUS SERVICE
## 1946-1953

| Year | Revenue[1] | Estimated Passenger Miles (000,000) | Passenger Miles 1949 = 100 |
|---|---|---|---|
| 1946 | $34,437,000 | 1,377 | 79.6 |
| 1947 | 35,896,000 | 1,436 | 83.0 |
| 1948 | 38,224,000 | 1,529 | 88.4 |
| 1949 | 43,254,000 | 1,730 | 100.0 |
| 1950 | 44,457,000 | 1,778 | 102.8 |
| 1951 | 46,556,000 | 1,862 | 107.6 |
| 1952 | 46,121,000 | 1,845 | 106.6 |
| 1953 | 45,415,000 | 1,817 | 105.0 |

[1]Source: Motor Carriers Freight and Passenger, D.B.S.

Of the public carriers air transportation has experienced the most impressive growth in passenger travel. Domestic scheduled and non-scheduled air passenger miles in 1954 were only 2.1% of rail. By 1949 they had

increased to 12.2% and in 1953 to 25.8%. This rapid growth is illustrated in the following table:

## POSTWAR TREND IN PASSENGER TRAVEL AIR AND RAIL EXCLUDING COMMUTER SERVICES — 1945-1953

| Year | Passenger Miles | | | Index of Passenger Miles 1949 = 100 | |
|---|---|---|---|---|---|
| | Rail (000,000) | Air (000,000) | Air as % of Rail | Rail | Air |
| 1945 | 6,380 | 132 | 2.1% | 206.0 | 35.0 |
| 1949 | 3,097 | 377 | 12.2% | 100.0 | 100.0 |
| 1953 | 2,882 | 744 | 25.8% | 93.1 | 197.3 |

Source: Dominion Bureau of Statistics.

As the distance of any journey increases, the competitive advantage of the airplane becomes more pronounced. Therefore the greatest penetration of the airplane has been in travel over transcontinental and long intercity journeys, precisely the field in which the railways were predominant. It should not be assumed, however, that the growth of air travel has been entirely at the expense of the railways. A considerable proportion of new travel has been generated by the speed of the airplane.

Over an extended period of time the railways have been giving ground to the private car and the bus, and in recent years to air travel which has penetrated the long-haul market. Traffic moving by rail is now predominantly for overnight trips, and intercity traffic along high density routes. This two-way squeeze on rail patronage may be expected to grow more intense as the speed and reliability of air travel improves, and highway expansion and modernization increases. Comfort and safety are the railways' greatest attractions, but there is every indication that the speed of rail travel may again become a competitive consideration of some importance in the future with the introduction of rail diesel cars and developments in light weight trains. In fact rail travel time for many intercity journeys is at present competitive with the airplane due to the time-consuming journeys to and from airports. The railways have a marked advantage over other forms of transportation for commutation service but costs are high because of the low utilization of equipment and fares are difficult to adjust.

The present division of passenger traffic between competitive public carriers and the private automobile is determined to a much larger extent by service considerations than is the case with freight traffic. Cost plays a secondary role in the passenger traffic field. Speed and convenience would appear to be the most important attraction to passengers with comfort ranking third. This is patently clear from the predominance of the private car for short distance travel and the growing attraction of the airplane for long distance movements, both of which are high-cost carriers.

Where costs do influence the passenger's choice there would appear to be a certain amount of artificiality in the present allocation of traffic between railways and buses. Between heavily travelled centres rail costs are at a minimum, and along low density routes the bus enjoys lower costs. Frequently, however ,the railways are left to serve the lines where traffic density is low and the buses concentrate their services along the high density intercity lines. The reason for this is to be found in the uniformity of railway passenger fares.

The pattern of railway passenger fares has a close similarity to that of railway class rates for freight traffic. The fare per passenger mile is the same for all lines and areas regardless of any existing differences in costs. Therefore, passengers along lightly travelled lines enjoy exactly the same fares as passengers on high density traffic lines although costs per passenger mile are undoubtedly substantially higher.

Competitive carriers' fares on the other hand are far from uniform reflecting differences in both costs and demand for their services. Airline fares range from 5 cents to 10 cents per passenger mile depending upon the route and are substantially higher than this on northern routes where costs are at a peak. Bus fares vary as to routes and regions in accordance with the particular costs of the operation and demand for the service, although there is a much higher degree of uniformity in bus fares than in motor carrier freight operations. This is very largely due to the close control of bus fares by provincial regulatory agencies, and to the fact that bus fares are patterned on railway coach fares which are uniform throughout the country.

Competition in the intercity passenger transportation field has benefited many. The private car has drawn people together in a way which has promoted national unity and understanding. The speed of air travel has removed the barrier of time-consuming long-distance travel and while still available to a relatively small section of the travelling public, it has brought businesses together in much the same way as the private car has done for people. The bus has been a boon to rural travel between points located some distance from rail centres as well as to low income groups generally.

Railways continue to make an important contribution to the nation's travel demands in that they provide high capacity services for peak periods and a comfortable, safe and fast means of travel for overnight journeys. For long-distance travel they attract those for whom economy and comfort still offer advantages.

Competition has affected the railways more than other carriers but there is still a place in the passenger field for rail services if they are permitted to rationalize their services to existing requirements. Fortunately there seems to be a growing awareness by regulatory authorities of the need and importance of a realistic approach with regard to abandonment of unremunerative passenger services. The introduction of more functional equipment such as the rail diesel car and improvements in transcontinental services have proved their value in holding traffic and attracting new passengers.

# SECTION IV

# FUTURE TECHNOLOGICAL DEVELOPMENTS NEW FACILITIES AND SERVICES IN THE TRANSPORTATION FIELD

## INTRODUCTION

Technological improvements in the transportation industry have been a continuing process over the years and much of the scientific revolution of the past quarter century has had a special impact on transportation facilities and services. In particular the discovery of new lightweight materials, new fuels and developments in power plants, so vital to efficient low-cost transportation, have completely changed the technique of moving goods and passengers. Contrast the modern high-powered diesel locomotive with the coal stoker of a few decades ago; the large efficient commercial motor trucks and buses with the solid 'tyred' spoked-wheel vehicles of the 20's; the speed of the turbo-jet and pure jet airplane with the slow moving strut-winged aircraft of a quarter of a century ago. These contrasts, together with the size of pipe and automatic processes used in today's pipeline operations, and the increase in size and efficiency of vessels in inland water transportation, show in true perspective the advances which have been made in the art of transportation.

Changes of equal importance are likely to take place over the next quarter century. The commercial application of radar, television and electronics, which have already made an impressive beginning, will play an important role in improving the efficiency of carriers. Nuclear energy will also make a contribution in time, although it is doubtful whether it will have much impact on commercial transportation over the next quarter century.

Predictions as to the shape of future technological progress in any industry is always a difficult task and particularly so in an industry as dynamic as transportation and in an age of scientific discovery on the scale being witnessed at the moment. Since the future can only evolve from the present, predictions in this report as to the future technological developments in equipment, facilities and services are based on present signs and portents.

## AIR TRANSPORTATION

SINCE the end of World War II, expenditures on airline facilities have been concentrated very largely on improvements and additions to runways, terminal and airway facilities to reduce the serious problem of congestion which has arisen at most airports from the phenomenal expansion of commercial and military air services. Much still remains to be done in further enlarging and extending existing runways and in meeting the accumulating need for new and improved accommodation facilities for passenger, mail and cargo handling at most airports. A good start has already been made on this aspect of the programme and facilities are expected to approximate demand by 1960-65.

In discussing future airport requirements the submission of Trans-Canada Airlines suggested that to eliminate traffic congestion and ensure safe operations "measures must be taken for the creation of satellite fields that will permit the segregation of military and light aircraft from the growing volume of civil air operations." The new jet planes which should begin operations between 1960-65, will require runways of from 9,000 - 10,000 feet. The expenditures entailed in this new standard of facilities may well necessitate a re-examination of the scale of landing fees and rentals.

In line with the provision of new and improved terminal facilities and in keeping with the anticipated increase in air travel demands, research in electronics is being accelerated for the purpose of providing aids to navigation which will further improve on the existing high standard of safety. A multi-million dollar programme is tentatively planned for this purpose. Replacement of the existing Canadian system of medium frequency radio ranges may be expected, as well as improved and augmented navigational aids in the vicinity of airports. Automatic approach aids will make possible safe flying operations under much more adverse conditions of cloud, ceiling and visibility than is now possible. The effect of this development on flight regularity should be very marked. Airborne radar will continue its spectacular development with respect to storm avoidance and navigational assistance as well as flight control of the aircraft itself.

In the interests of northern development, additional landing strips and improved navigational aids have been recommended in the submissions of several Yukon Territory groups as well as by Canadian Pacific Airlines. Permanent progress in mining exploration is dependent upon adequate facilities for wheel-equipped planes.

Advancement in the airplane itself is likely to be even more impressive than that which can be expected in airport and airway facilities. At the present time aircraft are in a transition stage. The modern turbo-prop, while making use of the conventional propeller, is activated by what in the future will become the standard jet power. Thus air transportation is entering the stage of great potential development, but the many ramifications must continue to be a matter for speculation.

Aircraft of the conventional propeller driven type and the latest turbo-prop units have attained very great efficiency from the standpoint of speed. Present long-range airliners cruise at about 300 miles per hour, whereas the turbo-prop averages some 400 miles per hour. The latter, introduced to the North American continent in 1955, is almost certain to replace conventional propeller-type engines on the more important routes over the next five years.

Able to combine long range with increased speeds, the turbo-prop also compares favourably with high-powered piston engines in fuel performance. In addition, it is much quieter inside the cabin. For these reasons, it offers a substantially improved type of service from the standpoint of speed, comfort, capacity and efficiency. These advantages of turbine power should further improve the competitive position of air transportation over the next decade.

The turbo-prop of course represents the intermediate stage to the employment of the full or pure jet engine. Turbo-jet engines will make possible flights at altitudes of 35,000 - 40,000 feet and average cruising speeds of up to 550 miles an hour. In terms of travel time this will mean substantial reductions in transcontinental and international services.

Trans-Canada Airlines' submission to the Royal Commission strikingly illustrated the greatly reduced air travel times which may be expected over the next decade. Some typical examples given were:

| | | 1955 | 1965 |
|---|---|---|---|
| Toronto | — Winnipeg ..... | 4 hours 5 min. | 2 hours 50 min. |
| Vancouver | — Toronto ..... | 8 " — " | 4 " 10 " |
| Montreal | — Halifax ..... | 2 " 30 " | 1 hour 35 " |
| Montreal | — London (Eng.) . | 11 " — " | 7 hours — " |

Because of the tremendous speed of jet aircraft and the fuel economies realized at extremely high altitudes, commercial jet planes are not suited to short hauls. It would seem logical to predict, therefore, that future long distance air travel will be jet propelled and the turbo-props will operate over medium and short-range routes.

The application of nuclear power to commercial operations, while technically possible within the period covered by this report, will have major economic hurdles to surmount. Its application to air transportation will be the most difficult of all forms of transportation because of the size of the airplane and the danger inherent in possible crash landings. A basic problem of course will be shielding, for until the weight of the protective shielding from the airplane's power plant can be reduced to economic proportions, there can be no commercial atomic plane.

Bearing in mind the direction of the substantial expenditures being made in improvements and additions to existing runways and air terminals and the installation of electronic navigation equipment, it appears that the pattern of future growth of air services will be along existing routes rather than in the opening up of new routes. In general, it can be said that existing services will be progressively increased and improved as conditions demand. As traffic grows the trend towards non-stop flights will increase in number.

In the short-haul passenger field, the helicopter seems destined to occupy a unique place in future commercial air operations. The technical characteristics of the helicopter give it an operating flexibility of considerable importance. Until recently, however, this has been achieved at the expense of speed and economy. But there is now ample evidence that the helicopter of the future will combine speed, high density seating and economy of operations with its present flexibility.

By 1965 helicopters should be coming into their own and by 1970 an extensive network of such services is forecast to be in operation. These will probably develop from two different directions. The key to the helicopter's usefulness as a transport vehicle is its ability to operate into the heart of cities. Therefore it should find extensive use in urban areas, serving as a speedy shuttle service for passengers, mail and cargo from city to airport.

The second and probably more important use will be in the provision of a fast flexible scheduled service for short-haul travel, trips of say up to 200 miles. Like the train, it could offer a "no change" service not possible for the conventional plane. The time saved in eliminating changes to other aircraft or surface vehicles will give it a greater average speed over short ranges than existing services despite the latter's faster cruising speed.

If the helicopter principle can be applied successfully to fixed wing aircraft to combine the advantages of both, it may be possible to realize the high point-to-point speed of conventional aircraft, and the terminal advantages of vertical lift. In the so-called convertiplane, therefore, may lie the greatest potential for all weather navigation, speed and safety in the air.

Expansion of commercial air services in the north would appear to be a certainty over the next 25 years. A combination of economic and defence considerations support this view. Exploration and mining developments in

the north country which may be expected to increase substantially have traditionally depended on the versatility of the airplane due to climatic, topographical and distance factors.

The other consideration is directly related to the continental defence lines currently being extended across the north, specifically the DEW and Mid-Canada Lines. It seems a reasonable conclusion therefore, as air carriers are already applying for new routes into the north as a result of activity in connection with the construction of the radar lines, that by 1960 a number of new routes will have been extended into the far north in both eastern and western Canada. These services, while essential from the point of view of the communities served, will for the most part be light traffic routes and hence high cost operations. The unbalanced directional flow of traffic and the sharp seasonal fluctuations in traffic may be expected to add to the problem.

No reliable estimate of the future development of international routes is possible since they are affected by so many factors other than technological developments and available traffic. Important among the various considerations is the direction and growth of international trade. Given the conditions essential for multilateral trade, further extension of services to European countries and possibly some new services to certain Asian countries may be developed over the next quarter century.

Air freight will continue to increase in the next quarter century, but it is not anticipated that new services will be established unless their cost to the shipper is considerably reduced. With a heavier volume to handle in the future, airlines may operate a type of aircraft which would offer lower rates. It is very probable that new and larger types of aircraft specially designed to carry freight will be developed.

# 2

## HIGHWAY TRANSPORTATION

DURING the past quarter century, highway transportation has emerged as one of the dominant features of the North American economy. Not only has the motor vehicle revolutionized the transportation industry, but it has become an integral and indispensable part of our modern way of life. The automobile is used to get to work, shop, visit, go to a show or just travel about. Trucks haul a large and increasing share of the nation's freight and, in providing a fast flexible service, have stimulated business directly, assisted in the decentralization of industry and been of invaluable assistance to the farmer and the small community distant from large cities.

This amazing growth of highway transportation in such a comparatively short period of time may be traced directly to the great technological advances which have been made in the design and operating efficiency of the motor vehicle. One has only to contrast the sleek, low-slung multi-colored automobiles of 1956 and the size and operating efficiency of today's transport trucks with their counterparts of the early '30's to appreciate the magnitude and significance of these changes. Yet it appears that even these great changes and refinements, as numerous as they are, may be completely superseded by wholesale changes in the next 25 years. While future improvements may be expected to concentrate on all aspects of the vehicle, indications are that the most radical changes will be in the engine. Current informed opinion in the automotive industry seems to be that improvements in the conventional internal combustion engine have just about reached their limit and future developments in motive power will probably be of a revolutionary rather than evolutionary nature.

Injection is heralded as the next major advance in the internal-combustion engine before the gas turbine takes over — perhaps 10 years hence. What will happen is that jets will spray gasoline directly into each combustion chamber, thus eliminating the carburetor as it is known today. It may make spark plugs superfluous as well. Changes such as these, by permitting sharply lower hoods, would further accentuate the trend to low-slung cars.

Beyond this, however, the gas turbine promises to become standard motive power in the future. Evidence in support of this is afforded by an experiment conducted in the United States with a gas turbine engine. A late model car without gearshift, cooling system, carburetor, or ignition system recently completed a cross-country trip in testing the revolutionary new development. Of lighter weight than conventional gasoline engines, the gas

turbine engine is reputed to operate on the cheapest kinds of fuels without increased consumption. This development is some years away from the mass production stage, but is well within the realm of possibility over the next quarter century.

Improvement in the design and operating efficiency of commercial vehicles will also take place on a continuing basis. Future development in the power units of commercial vehicles will flow from improved mechanical efficiency, higher operating speeds, fuel induction methods and higher compression ratios in combination with higher octane fuels. It is predicted by the automotive industry that these improvements should result in fuel savings for buses and trucks of some 25% to 30%. All of these improvements, moreover, are possible with the conventional gasoline engine. Diesel powered engines which have established their efficiency in heavy over-the-road transportation will also continue to make steady inroads in commercial trucking. Not only are there substantial fuel economies from diesel operations, but also important savings in maintenance, possible higher engine operating speeds and improved power-to-weight ratios.

Turbo-jet propulsion for commercial trucking has been mooted in much the same way as it has for other carriers. But it is the opinion of authorities that it will not find extensive use until a satisfactory solution has been found to such problems as high production costs, noise level, extremely high fuel consumption and the relatively short life of component parts.

Equally significant progress may be anticipated in chassis weight reduction, particularly for trucks, as this is a consideration of basic importance bearing on the earnings of commercial carriers. The automotive industry has made considerable use of aluminum in the past towards this end and there are now indications that aluminum may be progressively replaced by magnesium.

Greater use will probably be made of reinforced plastic in truck bodies in order to achieve a high strength-to-weight ratio, high corrosion resistance, improved insulating qualities and ease of maintenance and repair. It is predicted that liquid carrying tanks built with reinforced plastics will also find increasing use particularly in the handling of corrosive materials.

Apart from truck bodies, it would appear reasonable to anticipate reductions in the weight of engines, clutches, transmission and rear axles. Further weight reductions will accrue from use of tubeless tires and this will also add to the general trend towards less tare weight and increased pay load.

The submission of the Canadian Trucking Associations to the Royal Commission suggested other ways in which the trucking industry anticipates increased efficiency in the future. On page 52 it was stated:

> It is likely that common facilities for truck operators, such as clearing houses, joint terminals, warehouses, special communication networks

will be developed. These might be operated by specialist firms, or on a co-operative basis by the industry itself. More information on better managerial techniques, technical innovations, economic and financial aspects of operations will be disseminated by the industry's associations and trade magazines. In this way the small operator will be able to make use of the same advanced techniques and facilities as the big firm. An important factor in improving fleet utilization is the utilization of teletype and radio equipment. Teletype is already being used by all of the substantial trucking companies.

The rapid development and widespread use of the motor vehicle, which have so enormously increased the capacity and efficiency of our transportation facilities and changed the basic character of our transportation system, have brought with them many problems, the most serious of which has to do with the nation's network of roads and streets. Indeed, some authorities have predicted that the future development of highway transportation will largely be determined by whatever steps are taken toward solving the so-called highway problem, basically a condition brought about by the tremendous increase in motor vehicle registrations. This is true, moreover, with respect to both city streets and intercity highways.

Delays experienced by all forms of transportation in terminal areas are a major obstacle to economy of freight and passenger operations. But in no case is it more striking than in highway transportation. In the largest cities car ownership has outstripped the development of facilities in the downtown business districts. Motor vehicles which average up to 50 miles per hour on the open road are reduced to a crawl in city centres, their speed frequently averaging not more than five miles per hour.

The growing congestion on city streets in large cities and metropolitan areas is so obvious that it hardly needs elaboration. The submission of the Federation of Mayors and Municipalities expressed deep concern over its serious effect on the efficiency of urban distribution services and the economic waste involved. The City of Montreal for example, stated in its submission that congestion costs motor vehicle operators an estimated $30 million annually in fuel costs alone, not to mention the tremendous waste of time involved.

Steps taken in the past to cope with the problem (which will be accentuated in the future) include forcible use of alternate routes for through traffic, synchronization of stop-lights, more uniform speed enforcement, zones prohibited to commercial vehicles during specified hours, banning automobiles from downtown entry in the rush hour, prohibition against double parking, the provision of more off-street parking facilities, more one-way streets, extensive street widening and the setting aside of certain streets for passenger cars in transit only. These, however, have served mainly as palliatives in attempting to integrate the automobile into the over-all urban

structure. While they have tended to lessen the severity of the problem they have failed to get at its real cause.

There are many reasons for city congestion but underlying all is the phenomenal increase in automobile ownership and use. It is ironic that this very factor precludes the logical solution to the problem — increased use of public transit. Rather has it tended to affect adversely the development of public transportation, its fortunes having progressively worsened almost in direct ratio to the increase in the use of the automobile. As more and more people purchase private cars and patronage of public transportation falls off, fares are increased and this brings about a further shift to automobiles adding still further to congestion.

The result of all this — quite apart from the misfortunes of public transit — is that most city streets designed for an earlier day and age are hopelessly inadequate to cope with the present-day volume of traffic. Cities are turning to expressways as a means of speeding up vehicle movement and there is likely to be considerable expansion in this direction in years to come. The U.S. experience with expressways, however, has been that while more vehicles can be accommodated, there is little relief from congestion as the growth of private cars soon catches up with the additional capacity provided. Expressways, moreover, are very costly, some two-and-one-half to four times as much as subways to handle the same number of passengers. Furthermore they are no solution to the more important problem, the movement of people by public transportation. As automobile ownership is likely to increase at an accelerated pace in the future, relief for the problem of rapid mass transportation may lie in radical departures from the traditional approach. Transit authorities themselves are thinking increasingly in terms of radical solutions in an effort to keep pace with the changing requirements of mass rapid transit in the face of growing congestion. In recent years they have become acutely aware that city streets are just not spacious enough to be shared by public transit vehicles, passenger cars and commercial vehicles. The cost of widening, improving and building new city streets, moreover, is almost prohibitive at today's prices. Inasmuch as use of the private automobile shows no sign of decreasing, surface transit facilities will undergo considerable change over the next quarter century. What this may entail will probably be a system of rapid mass transit operating either underground or overhead, or a combination of both. Subways are an ideal solution, but a costly one. Few Canadian cities can afford a subway sufficiently extensive to provide real traffic relief. A new concept of rapid transit, therefore, is being actively explored — the elevated monorail. Though the idea is not new, the concept of travel is quite revolutionary. Successful monorail experiments have been carried out both in Europe and in North America.

It has been estimated that costs for a double track monorail operation could be as little as $700,000 a mile compared to a figure of $12 million a mile for conventional subway construction. In addition to low cost, the

monorail makes it possible to tap areas formerly considered uneconomic due to the high cost of transit construction.

While still largely in the experimental stage, the possibility of monorail transit may very well provide the radical solution to the problem of rapid mass transit.

A somewhat similar situation prevails with respect to the nation's network of intercity highways. Most of our present highway mileage was laid out and built 20 to 25 years ago and though adequate at that time is far from being so today. In recent years the numbers, speed and weight of vehicles have rendered a large portion of these highways functionally obsolete even for present traffic volume, let alone future requirements. The increase in highway traffic accidents, higher vehicle operating costs, increased travel time and, of course, congestion, readily attest to their inadequacy. Moreover, the great increase expected in motor vehicle travel in the future, particularly by commercial trucks, would appear to make substantial highway improvements necessary if this growth is not to be restricted with adverse effects on the country as a whole. Indeed it has been predicted that commercial trucking will increase at a faster rate than the economic growth of the country as a whole, though it is expected to vary considerably by regions. Growth of trucking between the Maritimes and central Canada is expected to be marked and with the opening of the St. Lawrence Seaway, motor carrier services between the Lakehead ports and Winnipeg will undoubtedly expand as these cities will become important bases of transport operations to and from western Canadian points.

Generally speaking, with the exception of roads in the Canadian North, future highway developments and improvements will probably be qualitative rather than quantitative in nature bearing in mind the changed composition of traffic. The trend in highway modernization in the United States and certain Canadian provinces provides some indication of the standards which may be expected in the future. These include divided multi-lane highways on which traffic can move quickly and without interruption by the provision of strips of land along each side of the road across which vehicles are not permitted to pass except at selected and appropriately designed places, grade separations at all major traffic intersections, shoulders at least 10 feet wide and so constructed that in an emergency vehicles can move safely on them, long straight distances making possible clear uninterrupted vision, lanes of different vehicle speeds and local service roads to separate express lanes where needed to provide access to homes and businesses. In brief, future roads will probably incorporate many new standards designed to enhance safety and improve convenience and comfort of travel.

The major problem will be the tremendous expenditures involved. In line with engineering advances therefore, new concepts of highway finance will probably evolve from which the improvements can be made.

In northern Canada the need will be for basic road facilities for resource developmental purposes. Submissions to the Royal Commission by representative governmental and business groups suggested that if mineral development is to proceed, access roads must be provided. The mineral exploration and development function of the Alaska highway for example, has been more important than its through transportation function. It appears reasonable to predict the construction of some of the following roads over the next 25 years. A road extending westward from the Mackenzie highway at Alexander Falls via Kakisa Lake, northward to Mills Lake proceeding to Great Slave Lake opposite Rae and southeast to Yellowknife and the Marian River region. Such a road with suitable ferry crossings would not only provide year-round transportation between a number of important mining centres in the Northwest Territories but it would also open up water transportation a month earlier on the Mackenzie River and Great Slave Lake. Development roads are needed from Yellowknife eastward to the north and south shores of the East Arm of Great Slave Lake and northeast from Pine Point to serve promising mineral areas, as well as from Pine Point to Fort Smith running in an easterly direction through the ranch lands of the Slave River basin. Such a road would connect a growing community with an important power development.

At some point it may be found justifiable to extend the portage road between Fort Smith and Fitzgerald to the southwest boundary of the Park and eventually to Fort Vermillion via the Mackenzie highway as a means of serving the valuable timber limits in Wood Buffalo Park. Also to open up potentially important timber and mixed farming areas, a road will probably be built from Fort Nelson to Fort Simpson via Nelson Forks, Fort Liard and the Liard Valley.

The Yukon Territory is reasonably well served by highways at the moment. Having regard to the size of the population, the Alaska and Whitehorse-Mayo highways represent a large mileage per capita. It seems reasonable to suppose, however, that over the next quarter century the Whitehorse-Mayo highway may be extended to Dawson City as an access road to mineral resources and as a transportation artery to one of the Yukon's richest farming areas. Also permanent bridges across the Pelly, Stewart and Yukon Rivers would eliminate the summer ferry and winter ice bridge connecting links for the Whitehorse-Mayo highway, permitting an uninterrupted year-round service not possible at present because of winter freeze-up and spring break-up.

In planning the future highways of the Yukon and of the Northwest Territories, attention should be directed primarily to the provision of basic transportation avoiding wherever possible duplication of facilities. Dividing the available traffic between two major carriers might well result in higher rather than lower transportation costs.

# 3

## PIPELINE TRANSPORTATION

At the present time approximately half of Canada's total energy requirements for residential and commercial consumption, transportation, etc. are supplied by the petroleum industry. It has been estimated that over the next quarter century these requirements will probably double, and the oil and gas industry's share will increase to two-thirds of the total. Pipeline mileage therefore may be expected to increase substantially by 1980. This prediction must be qualified however. Pipelines are a specialized carrier. Their growth is intimately related to the market demand for petroleum and natural gas. The Royal Commission was informed that the market has failed to keep pace with rocketing potential production. At the end of 1955, western Canada was capable of producing about 700,000 barrels daily and could conceivably have supplied all of the country's crude requirements. Actual 1955 production on the other hand was only about half of this amount. This condition of oversupply moreover is expected to continue for the next 25 years unless new markets are found. Any increase in pipeline mileage therefore will be contingent upon the successful solution of the industry's marketing problem.

In considering possible future markets, two obvious ones stand out predominantly as potential users of Canadian crude. The first is the Toronto area and it is almost a certainty that this market will be served by pipeline in the very near future. The other is the Montreal market, which represents a full third of total domestic crude requirements. The Montreal market, however, is presently served by the Portland-Montreal pipeline as well as by tankers during the open season of navigation. All crude delivered to this large refining area is imported either from Venezuela or the Middle East.

Thus the immediate solution to the oil industry's problem of oversupply lies in pipeline expansion of present facilities to supply areas in Canada now importing foreign crude and a possible increase in oil exports to the United States.

The technical problem involved in piping western crude to eastern Canadian markets presents no difficulty. It is in the realm of economics that the greatest uncertainties lie. Canada's fundamental transportation problem arising out of great distances, vast areas and small population reveals its pervading influence in comparative economic costs. While pipeline transportation for volume movement is considerably cheaper than any other method of land transportation for oil, it is more expensive than water trans-

portation. Because the densely populated portions of Canada are still in one long thin line and because Canadian oil fields are almost in the centre of the continent far from ports, Canadian crude, in order to compete in the Montreal market, must adapt itself to pipeline transport costs which are about three times as high as ocean transportation. It is therefore cheaper at the present time to import oil from the Middle East to the eastern part of the country, especially Montreal, than it is to pipe it in from Alberta.

Completion of the St. Lawrence Seaway will introduce a further competitive element in the market picture for Canadian crude, especially in the Toronto area.

Currently well informed opinion is convinced that despite these handicaps, the Montreal and Toronto markets will eventually be served by Canadian crude. Either a world shortage of tankers or a sudden increase in ocean freight rates could well equate tanker costs to a level competitive with Canadian pipelines. Moreover, the present disturbed situation in the Middle East precludes placing any great reliance on this area as a secured long-term source of supply. One oil industry official has forecast construction of a large-diameter extension of the Interprovincial line to Toronto by 1959.

Further market expansion is tied up with export demand. During 1955 a market was developed in Minnesota, Wisconsin and Michigan. Future potential markets are the Pacific Northwest of the United States as well as areas adjacent to the facilities of Interprovincial Pipelines Ltd. Securing these markets would have the effect of encouraging present major trunk lines in Canada towards progressive expansion programmes in the form of looping their present systems as well as adding additional pump stations and horsepower.

To date, Canadian pipeline development has been largely confined to the movement of Canadian crude. However, such pipelines will not be the only ones tending to increase the network of underground transportation in the future. In very recent years refined products have started to move for fairly long distances through pipeline systems. The Trans-Northern line from Montreal to Toronto is the longest product line in Canada, about 439 miles. There are also two product lines from Sarnia to Toronto. The total movement of refined products is approximately 114,000 barrels per day.

As additional producing areas are discovered, a substantial increase may confidently be predicted over the next few years in the way of small gathering lines. From these could grow a substantial network of small trunk or feeder lines. It has been forecast by one official that by 1960 gathering lines may be increased to the extent of 1,000 miles and the existing trunk lines might provide a further 2,000 miles of larger diameter pipe. It is not anticipated, however, that a completely separate second transcontinental oil pipeline will be built during the next 25 years.

Future advances of a technological nature in pipeline transportation will probably see an increasing use of larger sized pipe in keeping with the economies of large-scale operations. Automation should also play an increasingly important role in the future in developing automatic controls for the tedious work of opening and closing valves.

Electronic equipment is being used by pipelines for solving complex engineering problems and laborious accounting procedures. A new and interesting use of electronic calculators is to aid in the problem of dispatching numerous types of crude or products through a pipeline. Atomic science also has possible commercial applications for pipelines. In the United States it has already been adapted to certain control operations. Radioactive isotopes are being used in the oil stream by some carriers to mark the dividing point between batches of different kinds of oil.

# 4

## RAILWAY TRANSPORTATION

As has been seen, the last 25 years have brought many changes in the transportation field. So great have they been that they have tended to overshadow the parallel advances made in the older method of transport by rail. Yet technological advancement in the railway industry during this period has probably been greater and on a more widespread scale than at any other period of its long history. Particularly has this been so during the past decade. Though the basic technology of steel wheels moving over steel rails has not changed, radical new developments in motive power, track, equipment, terminal and handling facilities, traffic control, etc. have virtually revolutionized the art of railroading.

The most outstanding postwar development has been the large scale conversion to diesel power. Applied in the early stages to freight and switching operations, today in Canada more than 50% of gross freight ton-miles are hauled by diesels as against only 5% in 1950. It is anticipated that by 1960 freight service will be almost completely dieselized.

Because of its greater combustion efficiency and lower fuel costs, coupled with the ability to operate over transcontinental distances with a minimum of servicing enroute, the diesel has made possible substantial cost reductions and improved operating efficiency — as much as one-third on certain services for one railway in terms of gross ton-miles per train hour and as much as 40% for another in gross ton-miles per train mile. Thus the diesel has improved to a marked degree the competitive ability of the railroads.

With the programme of freight train dieselization well under way, the availability of diesel passenger locomotives especially equipped for train heating marked the beginning of diesel conversion of passenger operations. Currently the transcontinental passenger runs of both major railways, as well as a number of important high density routes, are completely dieselized.

Judging from present indications, it appears that equally significant changes in motive power may be expected in the future. Research is already under way on a lightweight diesel locomotive in an attempt to eliminate the heavy and expensive motors and generators used on conventional diesel electric locomotives. It is reported that this lightweight locomotive will be little more than half the weight of present-day diesels and will be powered by a mechanical drive not dissimilar to that which is being used by some passenger cars. Its speed has been estimated at 120 miles per hour when

hauling a low-slung lightweight passenger train. To what extent such a locomotive would be adapted to Canadian railway operations remains to be seen. It appears, however, that its most efficient use would be in high-density passenger services. While today these number only a few in Canada, the projected increase in population might very well alter the picture.

For the more distant future the coal-fired gas-turbine may have possibilities. It has been forecast by scientists that within a very few years the gas-turbine engine will be an actuality. Quite apart from what this might mean to Canada's coal industry, potential advantages of the gas-turbine will be increased efficiency with increased size of the unit, and economical utilization of waste exhaust for the heating plant. Another important advantage is increased power efficiency at reduced temperatures. This could be important for any future rail development in northern Canada.

Turning to the realm of pure conjecture there is the possibility of atomic powered locomotives. However, it is doubtful whether this form of power will have any commercial application in railroading during the next quarter century.

Equally significant changes may be expected in the way of freight and passenger equipment. While the passenger trains of recent years incorporate many new and unusual features both in design and in convenience of travel, the passenger trains of the future will probably be of a radically new type as exemplified by the low-slung streamlined trains, prototypes of which are presently being experimented with in the United States. Revolutionary in design and combining speed with economy of operation, these trains may prove to be an important factor in the highly competitive passenger traffic field, bringing back to the railroads some of their lost patronage. Railway executives confidently predict a resurgence of intercity rail travel if and when these experiments prove successful.

Important changes may also be expected in the design of freight car equipment such as the provision of units of low initial cost with broad flexibility in service. Some of the potential innovations include multiple-purpose box cars with sliding or detachable roofs and with wide doors for ease of loading, flat cars with ends which can be raised or lowered to accommodate the needs of particular commodities, underframes of much lighter weight with no sacrifice of strength, as well as heavy underframes of conventional design on which could be mounted different types of bodies of very light construction for the promotion of technical co-ordination of rail and motor carrier operations.

Such innovations may offer a partial solution to the problem of economic obsolescence of freight car equipment. Frequently equipment must be built to meet changes in shippers' requirements long before the equipment in use has physically depreciated. If through technological change the cost of producing railway cars can be reduced it may become possible to scrap cars

more quickly in line with changing traffic requirements. The present cost of equipment makes a reasonably long period of utilization imperative.

Concurrent with greater efficiency in motive power and improved rolling stock, speeds of both passenger and freight trains have been progressively increased. Transcontinental rail passenger travel time has been almost halved since it was first inaugurated, while travel time of many important intercity runs has likewise been considerably reduced. Notable gains have also been made in the speed of freight trains — as much as a day on certain transcontinental runs — with proportional reductions on other mainline interprovincial runs. Further reductions in transit time may be anticipated in both freight and passenger services as diesel power replaces steam power and eliminates the frequent stops required for refueling and taking on water.

Increased speed in railway operations has also been brought about by improvements in the railway plant through such innovations as new and stronger track, mechanization of maintenance procedures, improved signalling systems and the utilization of electronic equipment in yard and terminal operations. Initial experiments with continuous one-piece welded steel rail in the past few years have been sufficiently encouraging to predict an increasing use of this type of installation in the future. Very substantial improvements in the efficiency of freight yard operations have been derived from the use of automatic car retarders, loudspeaker systems, push button operation of switches, interyard radio facilities, recording and communicating systems and other electronic devices. Future improvements may likewise be expected through further application of electronics to railway operations, not only to yard and terminal facilities but also to internal railway operations.

Electronic machines, which are just making their appearance in transportation, will introduce new administrative concepts to railroading. Integrated data processing techniques should permit very rapid processing of routine accounting for the freight traffic and operating departments. Through these machines information previously unavailable because of the cost and time involved in human labour will become immediately accessible to management to assist in policymaking. The installation of automatic reporting, transmission and accounting systems will greatly aid the speeding up of the movement of freight trains in the future.

Another possible application of electronics to railway operations is train identification by the *Indentra* microwave relay system. With this new technique a train will be able to set up its own route by controlling switches and signals and simultaneously flash an announcement of its arrival on a station bulletin board.

Successful application of television to yard operations has recently been made in North America and the future holds out considerable promise for

further utilization. The yard office through the aid of television can now receive information on a train in motion, thus expediting switching operations to the appropriate classification tracks for marshalling into other trains. In the way of new facilities and services to meet the growth of competitive carriers, there will be a gradual extension of fast freight train services for merchandise traffic and of pool car services. Continuing improvements in LCL freight services will be made over the next quarter century. Indeed there may be major developments in consolidation of LCL and express service into a single rapid form of transportation. New equipment and streamlined methods recently introduced to handle this type of traffic will undoubtedly be extended. These relatively new developments will provide a smooth traffic flow even at peak business periods with operating economies and improved service to the public. Extensive alterations to track and platforms and the introduction of conveyor belts to expedite incoming and outgoing traffic will be a continuing process. The rapid transcription of waybills through the employment of modern intercommunications and tape recorders should be commonplace over the next 25 years.

A type of service rapidly expanding at the present time is trailer-on-flat-car operation. In view of its success in recent years, together with the possibility of improved techniques, this service should continue to expand in the future.

The advantages of trailer-on-flat-car operations stem from both the cost and service characteristics of the technique which includes the best features of both forms of transportation — the low line-haul costs of railways and the low terminal costs of motor carriers, combined with door-to-door service and flexibility of operations. Moreover, with more and more shippers locating away from railway tracks, trailer-on-flat-car operations appreciably assist the railways in maintaining their competitive position. Though presently being utilized only on certain high density traffic routes, trailer-on-flat-car operation may, if several new innovations and adaptations of the basic technique prove feasible, eventually enjoy much more widespread application.

A type of combination highway-railway trailer recently tested by a large American railroad holds out interesting possibilities in this respect. Known as the Railvan, the new vehicle has two sets of retractable wheels, one set equipped with rubber tires for operation on highways and streets, and the other with flanged wheels for operation on rails. The vehicles can be assembled and coupled together much as standard railway cars and drawn by a locomotive.

Other forms of physical co-ordination of rail and highway services may also make their appearance. A number of European countries have for years been offering container services. The size of the containers, however, has been relatively small and not suitable for North American operations.

Several railways on this continent are now experimenting with movable truck bodies which can be readily lifted on or off flat cars or flat-bottom gondola cars. The advantages attributed to this type of operation over the trailer-on-flat-car service are greater flexibility, hence wider application and lower cost.

One Canadian railway is experimenting with a rail-water-highway co-ordinated service for the handling of bulk liquids. Specially designed aluminum containers, each having a capacity of 12,000 pounds and set in its own steel cradle, will be moved close to a thousand miles by rail, transferred by swivel cranes to ship, from ship to flat cars and finally from flat car to truck by special hydraulic lift. If successful this technique would open up many avenues for movement of liquid products, as it will make possible more expeditious service and improve the condition of the product on arrival.

There would appear to be little doubt that co-ordination of rail and highway service and even rail-water-road service will become increasingly important over the next few years in the interests of more efficient service, lower costs and the utilization of each carrier to its best advantage.

Insofar as new railway lines are concerned it should be noted that since World War II practically all new construction has been in a northerly direction, rail lines having been extended to such northern frontier points as Kitimat, Knob Lake, Lynn Lake and Chibougamau. The desirability of additional railway services in other northern regions of Canada was the subject of considerable discussion before the Royal Commission and a number of submissions stressed the need for rail expansion to assist colonization and development of natural resources.

One of these proposals was that put forth by the Commissioner for the Northwest Territories for construction of a line from the present rail terminus at Grimshaw, Alberta, to develop the promising mineral deposits at Pine Point. Advantages claimed for such a service include reduced rates for inbound merchandise traffic as well as for outbound concentrates which now pay water rates equivalent to the water carriers' general merchandise rates, and a general stimulation of the development of agriculture and forest resources presently lying dormant due to the high cost of existing transportation.

The problem in providing such a service is one of economics. The proposed rail extension would very largely parallel the existing Mackenzie highway and Mackenzie River system. In addition, there are several air services in the area. Construction of a railway therefore would adversely affect these carriers. Moreover, traffic is relatively light and strongly directional in nature while population is small and widely dispersed over great distances. Little hope is held out therefore for profitable railway operation on a commercial basis at least in the foreseeable future. As for the operating deficit which is inevitable during this time, the suggestion was made that "the C.N.R. and C.P.R. together might feel able to carry at least part of this deficit." It has

been pointed out in other sections of this report that the railway industry, beset on all sides with growing competition, can only accept this type of obligation at the risk of further weakening its competitive position.

There are similar problems in connection with most proposals for the provision of rail transportation in the north. If railway transportation in northern Canada is deemed necessary, there would appear to be no alternative to the federal government and the various provincial governments underwriting at least part of the cost of construction and loss from operation.

Other possible future railroad projects in the north are the following:

(1) A further extension of the Pacific Great Eastern Railway to Fort St. John and Dawson Creek.

(2) The building of a line to the Lac La Rouge area of northern Saskatchewan.

(3) The shortening of the present circuitous route of the Hudson Bay Railway.

(4) The construction of a line of about 1,500 miles from Churchill to the Pacific coast.

(5) The construction of a line east from Lake St. John or Murray Bay in Quebec, and a possible extension of such a line to Labrador.

## WATER TRANSPORTATION

THE opening of the new St. Lawrence Seaway to navigation will be the most important single development influencing the future pattern of water transportation in Canada. This is clear from the economic geography of Canada with the Great Lakes - St. Lawrence route located almost in the centre of the five physiographic regions of the North American continent. The new seaway will link the Canadian West to the Atlantic seaboard, and it will join the wheat fields of western Canada to the United Kingdom and other European markets.

While it is difficult to attempt to predict the effect of the seaway upon various communities or on other competitive carriers pending the report of the Royal Commission on Coastal Trade and the establishment of the level of tolls, it is possible to speculate generally on what may be expected to accrue from the advantage of direct low-cost water transport into the very heart of industrial Ontario and the American middle west.

The fundamental justification for the navigation features of the new seaway project is, of course, the reduced transportation costs which should result from the use of the enlarged waterway and the consequent employment of larger vessels than are presently operating in both coastal and foreign trade.

In the past, savings anticipated from the seaway were seen largely in terms of moving grain to the seaboard at the lowest possible cost. The savings that would result from an uninterrupted movement of grain in large bulk carriers from the head of the lakes to Lower St. Lawrence ports have been variously estimated by Canadian and United States authorities from five cents to seven cents a bushel—even allowing for a considerable upbound movement of ships in ballast. The heavy westbound movement of iron ore now envisaged, which might in time reach as much as 20 million tons a year, holds out promise of even greater savings and a more efficient use of shipping. It is currently estimated that more than 60% of the total upbound movement will be Ungava ore. Thus, ore would seem to be one of the essential keys to the seaway's future traffic pattern. Carriers delivering ore from Sept Iles to Lake Erie ports might find it of advantage to either load downbound coal for Quebec destinations, or clean ship enroute and carry grain on the down-trip to Montreal. The upbound cargoes are likely to outweigh the down-bound cargoes — just the opposite of the present pattern and thus competition for downbound cargoes may well further affect the level of rates.

The three commodities mentioned, iron ore, grain and coal, will certainly constitute the major part of the traffic moving through the new seaway.

Substantial transportation savings should result from continuous carriage through the seaway in large bulk carriers, one of the cheapest methods of transportation in the world. These savings cannot be estimated with any degree of accuracy until the level of tolls has been set. It is provided in the St. Lawrence Seaway Authority Act that tolls shall be sufficient to cover the cost of maintaining and operating the seaway, of paying interest at current rates on the funds borrowed and of amortizing the investment over a period of 50 years.

Certain interests which have traditionally opposed the seaway, in the belief that the economic cost of the dislocations which would be involved would more than offset the savings envisaged, have now progressively come around to the view that the growth of the Canadian economy due to the seaway will be of general benefit, although it will create some local problems.

The completion of the seaway will, of course, cause temporary dislocations and render certain facilities obsolete. Maritime coal, for example, will be faced with increased competition from U.S. coal in its traditional Quebec market. A number of small Ontario ports which have profited as milling-in-transit points will be adversely affected and others will be eliminated completely. While the West stands to benefit generally, Vancouver may lose part of its distributive trade to Winnipeg.

Inland shipyards will have to meet much keener competition from coastal yards and perhaps also from overseas yards, though they may benefit by an increased volume of maintenance and repair work. Canallers will have great difficulty in competing with large freighters, if they can cope at all. The railways stand to lose a certain amount of bulk traffic but it is now believed that the general stimulus to the economy which will flow from the power and navigation project may, in time, create compensating increases in other types of freight. The president of the C.N.R., for example, was taking this broader view when he said, speaking of the seaway: "Whatever tends to open Canada up and keep it growing is good for this railroad."

The seaway will bring about the need for a number of improvements to docks, harbours and terminal facilities. The submissions of the Canadian Industrial Traffic League and of the Canadian Manufacturers' Association, which were widely representative of the shipping public, all stressed the importance of improved dock and port facilities. A number of harbours on both sides of the boundary line will probably require deepening and improved loading and storage facilities.

Montreal, anticipating a greater inflow of grain tonnage, is already expanding its port facilities in preparation for a greater volume of trans-shipment. It is suggested that all river ports, from Sept Iles in the Gulf to as far

as Prescott, Ontario, at the upstream end of the International Section, will require improvements to their port facilities.

The present St. Lawrence canals restrict the size of ships to those carrying about 3,000 tons of cargo and drawing only 14 feet of water. The seaway will permit big vessels of the upper lake type carrying over 20,000 tons to reach Montreal and ocean vessels of from 8,000 to 10,000 tons to travel beyond Montreal to the Great Lakes. The opinion has been expressed, however, that few ocean vessels might actually pass Montreal as these ships, built for heavy seas, are short and deep with engines amidships. Lake vessels are longer, with engines in the stern and crew quarters in the bow, leaving more room for cargo amidships. All modern upper lakers built in recent years are of 25,000 tons capacity. This means that they can carry upwards of 700,000 bushels of grain as against 300,000 bushels for the ocean freighters. It is therefore believed that upper lakers will practically handle all bulk traffic offered. Indeed, some authorities have predicted that the seaway's most important role will be to make it possible for lakers to go downriver, rather than to permit ocean ships to enter the lakes.

With the substantial increase in ore tonnage anticipated on opening of the seaway, significant technological advances are being made in the efficiency and design of lakers. These include reduction in the weight of the ship through greatly increased use of electric welding and corrugated bulkheads and more scientific distribution of structural material.

By far the commonest of the recent innovations designed to increase efficiency of water transportation has been the emphasis placed on converting the ore carrier into a dual purpose vessel capable of carrying oil or ore on alternate voyages. It is possible that with the opening of the seaway still another type will be added, capable of carrying not only ore and oil, but also general cargo on the Great Lakes and in the ocean trades. The principal advantage of such a vessel would be increased flexibility with the possibility of reducing the general level of rates.

Most ships of the existing upper lake fleet are dual purpose vessels, capable of carrying ore or grain equally efficiently, while their counterparts operated by U.S. Great Lakes companies are designed essentially as ore carriers.

In their search for improved efficiency naval architects have made great strides in recent years in designing and building vessels for the handling and transportation of bauxite and alumina. A vessel completely constructed of aluminum alloy has also been designed with an effective gain in carrying capacity of about 20%. Such alloys will find increasing use in the shipbuilding industry in years to come once the price becomes competitive.

The application of atomic energy to commercial water operations, is in much the same position as for other carriers — commercially unlikely during the next quarter century. The United States Congressional Record,

1955 (May 2, 9, 10 and 31) indicated that if an atomic power unit similar to that used by the nuclear submarine *Nautilus* were adapted to a commercial ship developing 8,000 h.p., the capital cost of the reactor plant alone would be $21 million compared with $2.5 million for a conventional power plant. The cost of a single charge of fuel for the reactor would be some $3 million covering a two-year sailing period of 200 days per year, compared with $360,000 for a conventional ship. For commercial application of atomic power to water transportation, therefore, very substantial reductions in both the capital costs of the power unit and in fuel costs will have to be realized.

However, atomic energy will probably find its first commercial use in water transportation. When it does, the effects should be reduction in machinery weights and elimination of the weight of fuel, thus enhancing the efficiency of water transportation.

In addition to the St. Lawrence Seaway, one of the most desirable future developments would be the establishment of a year-round low-cost freight service between Rimouski and the north shore of the St. Lawrence, principally to Baie Comeau and Sept Iles. Adequate transportation to the north shore of the St. Lawrence is important for fostering the economic development of this area, so rich in mineral deposits and undeveloped water power supply. A winter service between Rimouski and the north shore should be carried out by one or two vessels reinforced for ice-breaking purposes or by regular ships assisted by a government ice-breaker. All necessary supplies could be moved by rail to Rimouski and then carried to destination by the suggested water service. Possibly the most economical manner in which the proposed water transportation could be maintained in the winter time would be through the assistance of government ice-breaking service.

Consideration might also be given to the possibility, at some time in the future, of using the Gulf of St. Lawrence up to Baie Comeau and Sept Iles all year round.

A second area where it appears that water transportation should be assisted extensively is along the Mackenzie River to Aklavik. The Department of Transport will be called upon to improve aids to navigation and the Department of Public Works will undoubtedly be asked to construct additional dock facilities and improve the channels to permit more economical water transportation in line with the development of the Northwest Territories which is anticipated within the next 25 years.

Some years ago considerable attention was given by the governments of the United States and Canada, through the International Joint Commission, to improving the water route between Sorel, Quebec and Albany, New York. The last report of this Commission suggested that no action be taken until the completion of the St. Lawrence Seaway. This question should be reviewed after the completion of the seaway in order to determine the

advantages and disadvantages of constructing a new Chambly Canal as well as the completion of a new waterway from Lake Champlain to Albany, N.Y.

On the west coast of British Columbia it is anticipated that over the next 25 years, barge traffic will grow to considerable proportions in order to cope with the traffic offered in that area. It is possible that the most economical mode of transportation will be the operation of mammoth barges moving along the B.C. coast with the regularity of freight trains. This might replace the present steamer coastal services.

A recently instituted co-ordinated water-rail service between Vancouver and the Yukon territory shows promise of extension in the future. Specially designed containers each of five tons capacity will be carried in the hold of ships from Vancouver to Skagway. They will be fork lifted from the hold directly on to flat cars for movement to the Yukon territory. Dock handling, an expensive operation in the north, will be eliminated and chances of damage to cargo reduced. Outbound traffic of certain types will be able to utilize the containers on the back haul.

### *Summary*

Predictions as to future technological development in the transportation industry have without exception erred on the conservative side and each form of transportation has been written off as a useful addition to the industry before it had reached an early stage of development. It is for this reason that this report envisions technological developments over the next quarter century which will be equally as significant as those experienced over the past quarter century, although different in nature. It is doubtful whether any new forms of transportation will evolve, but much greater efficiency from those now in operation is a certainty.

# APPENDICES

*Appendix A*

# AN APPRAISAL OF THE MOTOR CARRIER INDUSTRY

by A. F. HAILEY

*Some Strengths and Weaknesses*

The motor carrier industry is an industry of strengths and weaknesses. Its greatest strength lies in its operating flexibility, combined with speed and the degrees of personalized service it can give. Its greatest weakness is in its looseness of organization and the absence of an ordered industry policy capable of being channelled for the national good.

The motor carrier industry is actually a series of industries within an industry. Some of these are organized into strong and efficient groups. Some are organized only in a nominal sense and others are not organized at all.

The diversity of the motor carrier industry is one reason for a serious lack of data about it. To some extent this gap in information is now being filled but it will be many years, if at all, before statistics about motor carrier operations can be quoted with complete assurance of their accuracy, as can be done with other carrier groups where the number of individual companies comprising an industry is small.

Even where statistics are available it is difficult to reach mathematical conclusions about motor carriers. An average truck load, for example, is a cipher and little more. The wide diversity in size of motor truck equipment, ranging from half-ton local pick-up trucks to highway tractor-trailers with gross weights of 34 tons or more, makes an average of this type meaningless for practical purposes.

The problem of computing ton-mile costs for all motor carriers is equally difficult. Many truck users have no idea of their ton-mile costs. Others do not retain the data which would make computation possible even if some agency could undertake the gargantuan task of assembling it.

The best that can be done in this case is to take a representative cross-section of motor carriers with the necessary records, average out their ton-mile costs and accept the result as a basis for discussion.

Regulation is another factor. The motor carrier industry is at the same time under-regulated and over-regulated. It is under-regulated in the sense of provincial weakness in the enforcement of motor carrier regulations and it is over-regulated in that there are ten different sets of motor carrier laws and regulations, one in each province. No two of these are identical, and over the whole range of them are major differences in policy and administration. A more detailed review of motor carrier regulations is given later in this section.

### *Motor Carriers — A Division by Types*

For purposes of discussion the three main groups within the motor carrier industry may be defined as:

1. "For-Hire" intercity carriers, whose operations include city and urban pick-up and delivery.
2. "For-Hire" cartage carriers, engaged solely in local hauling.
3. Privately owned trucking operations, ranging from the single small panel truck of a local store to the large local or intercity truck fleet of a major business company.

These, of course, are only broad classifications. In practice there are many more classifications, with subgroups within them, and overlapping between them all.

Within these three main groups, as within the motor carrier industry as a whole, there are varying degrees of industry organization.

### *The Intercity For-Hire Motor Carrier Industry*

The intercity for-hire section of the motor carrier industry is the only section organized both provincially and nationally and it is this section which is currently contributing most to the sum of knowledge about motor carriers generally.

For-hire motor carriers are a logical extension of the day when an individual could buy a horse or mule and transport his neighbour's goods from one point to another for reward. During the unfolding era of the advent and improvement of motor trucks and tractor-trailers, many individuals bought trucks as casually as their predecessors bought horses and set themselves up in business, after a while concentrating on specific routes or areas. Because of the rapid progress of motor transport these original for-hire carriers grew rapidly until provincial authorities, at varying times and in varying degrees, imposed regulations upon the carriers aimed at the general public good.

Upon this motor carrier industry which originally "just growed", therefore, a mantle of regulation has been placed with varying degrees of success. And despite this regulation, the effects — some good, some bad — of the original growth of the motor carrier industry are still present today.

The good effects of the for-hire carriers' development are present and apparent in the general life of the community. The willingness of motor truck operators to take a business risk and begin service in doubtful conditions has resulted in the development of new areas and industries. The wide range of goods now transported conveniently and quickly by truck and tractor-trailer has made possible improved merchandising methods and contributed to improvements in the standard of living. The planning of new developments of all kinds takes for granted the availability of motor carrier services in helping the plans reach fulfilment.

Against this, some bad effects of the mushroom-like development of for-hire motor carriers are equally evident. While many companies which pioneered in motor carrier operations and others which have since joined them have progressed to high standards of business administration, business ethics and safe, responsible operations, there are other companies which have done none of these things.

Fortunately the more responsible type of for-hire carrier is gaining both in size and influence. Motor carriers of this type are conscious of the need for good administration, careful control of costs and operation at consistent rates in the light of costs. Such companies insist on high standards of vehicle quality and maintenance, careful selection and training of drivers and adherence to rigid safety operating codes. Their terminals are designed for fast, efficient handling of freight, making use of material handling equipment. Their record systems are complete, with an increasing number of carriers making use of machine and punch-card accounting systems, permitting detailed cost analyses and immediate tracing of individual shipments — a process aided by teletype networks now employed by almost all major truck transportation companies.

Motor carrier operations of this type are headed by management groups of high executive calibre, many of whom are specialists in particular phases of the road transport business. As is customary in any efficient industrial organization, the management group constantly reviews operating methods with the objective of improving service, efficiency and cost control and at the same time aiding the company's competitive position.

It is the for-hire motor carrier companies of this type which have been largely responsible for forming trade associations, naturally with the objective of self-protection but also with the aim of promoting better practices and self-policing where this is practical and within the law.

For-hire motor carriers of this higher type are as deeply concerned as any enforcement authority — and frequently more concerned — with the problem of motor carriers at the opposite end of the operating scale.

The for-hire motor carrier with poor operating standards is a problem as much to his own industry as to other competitive forms of transportation.

The comparative ease with which an individual can buy a truck and go into business for himself is the situation which creates this problem. Admittedly, in those provinces requiring proof of "public convenience and necessity" before an operating licence is issued, there is reasonable control of entry into the business but the number of new operating permits issued each year is proof of the strong attraction which the for-hire motor carrier business still holds for individuals.

Unquestionably this individual enterprise is natural in a society where reasonably free competition is encouraged and it is also desirable to the extent that it is a part of the continuing general expansion of Canadian

business. But the problems created cannot be denied, nor can their effect upon the general pattern of transportation be lightly dismissed.

Even though some provinces insist on proof of public convenience and necessity before a truck operating permit is granted, unfortunately there is no test of business acumen for the licensee. Thus many people have been, and are, engaged in for-hire motor carrier hauling with only a limited knowledge of sound business practices. Because of this limitation, and also a lack of long-term planning, there is often little concern with the need to ensure an adequate return on investment, the establishment of reserve funds or the provision of funds for replacement of equipment.

Concerned also with the day-to-day need for survival, the less desirable type of for-hire motor carrier may cut rates to an uneconomic figure, or cut corners on cost items such as proper vehicle maintenance, occasionally with disastrous results.

The whole effect is harmful to the public interests since good standards of transportation service are undermined and the motor carriers who are conscientious operators are placed at a competitive disadvantage.

Some further general comments, affecting for-hire motor carriers as well as other motor carriers are made later in this section.

### *Local Cartage Motor Carriers*

A second main segment within the motor carrier industry comprises the for-hire carriers engaged in local cartage. Generally speaking the extent of their operation is within the urban areas they serve.

Here again there is no clear cut division of function, because of overlapping with other types of motor carriers. Intercity for-hire carriers, for example, are sometimes also engaged in local cartage and, conversely, some companies whose business is predominantly local may also be engaged in intercity traffic.

In addition, there is the question of whether the pick-up and delivery operations of the for-hire highway carriers should be regarded as cartage services. In one sense the vehicles used are performing a local cartage function but in another sense they are part of an integrated intercity highway operation. It is this question which has led to problems in estimating the number of vehicles used by various types of carriers. Some surveys have included the pick-up and delivery vehicles of for-hire highway carriers in the total of urban trucks. Others have placed them in the intercity highway category. Thus there is much confusion as to the actual physical size, in terms of the number of vehicles both of the for-hire local cartage groups and intercity for-hire motor carrier group.

However, where local cartage operators confine themselves to municipal or urban areas, there seems no question that they are performing a unique

and necessary function. Their sphere of competition is largely confined to their own industry group and, generally speaking, they do not vie for traffic with other types of carriers. In some cases, in fact, the local cartage operators provide feeder services for other transportation agencies — railways, airlines, water carriers and intercity motor carriers.

With some exceptions in the larger cities, local motor carrier cartage work is usually spread over a large number of small companies. Licensing and regulation of this type of operation is invariably a municipal matter and, therefore, general policies and the degree of enforcement of regulations vary widely throughout the country. It is generally accepted that if local motor carrier operations are to be regarded as having a place in the national transportation pattern they must be accepted as they are, for certainly it would be impossible to administer such carriers at any level higher than municipal.

It should be said that in most cities local cartage groups have formed trade associations and are seeking to encourage sound business practices. But because of varying conditions in the many cities and towns where local cartage operations exist, it is impossible to appraise the degree of success of these efforts.

### *Private Motor Carrier Operations*

The third general classification within the motor carrier industry is that of private motor carriers.

This classification embraces more subgroups than any other and it is extremely difficult to assess its place — if it has a precise place — in the national transportation pattern. It is also very doubtful whether all components of private motor carrier operations can rightly be regarded as components of the motor carrier industry. However, motor carrier registration figures include trucks of all types. Hence, in any survey of motor carriers it is usual to include all private trucks, though many truck owners would be surprised to know of their recognition as part of the transportation industry, having come to regard the truck or trucks they own as part of their immediate business or personal destiny, and nothing more.

To be more objective in a review of private motor carrier operations, the private motor carrier classification may be said to comprise three main groups. These are:

(a) Privately owned trucks used by individuals (such as artisans or merchants) or by small companies as tools incidental to their main businesses; and farm trucks.

(b) Privately-owned truck fleets owned by substantial retail or manufacturing businesses or by public utilities for use within metropolitan areas.

(c) Privately owned trucks or tractor-trailers used by manufacturing companies for intercity transportation.

In a survey of national transportation facilities such as this, little more can be said of group (a) than to acknowledge its existence. Though representing a large proportion of all motor trucks registered in Canada, the uses of these vehicles are so diverse and in many cases so personal that they defy analysis. Certainly there can be no over-all control of them even if it were desirable, other than the general control that is exercised by provincial governments over automobiles.

Much the same situation exists with the privately-owned vehicles of group (b). The owners of these vehicles are merely exercising a natural privilege of transporting their own goods in their own vehicles from one point to another. Their limitation is the practical limitation of capacity vs. distance. Generally speaking it is extravagant to operate small or medium size trucks beyond city limits or a general radius of 50 miles because after that the cost of operation usually exceeds the value of service performed.

The vehicles of group (c) are fulfilling a specialized function for their owners, namely the bulk intercity movement of company-owned goods. The decision by an industrial company as to whether to operate its own intercity tractor-trailers, or rely on the for-hire services either of motor carriers or other forms of transport, usually depends on several factors, namely:

(i) Whether or not the company already has established a motor carrier fleet operation. This is particularly important nowadays because of the heavy initial investment involved in buying vehicles, building garage and storage facilities, employing management, operating and administrative staff, creating a special inventory and adding various other substantial items, to overhead cost. Industrial companies which do not already have these facilities are showing increasing reluctance to create them when existing keen competition between rival forms of for-hire transportation permits them to enjoy a high standard of service at reasonable rates.

(ii) Whether or not the company believes it can pare transportation costs through use of its own intercity transportation, notwithstanding the heavy investment involved.

(iii) Whether the possibility of higher transportation costs by the company's own vehicles can be more than offset by the eventual advantages of close control of traffic movements, flexibility of schedules, dovetailing of successive manufacturing operations or improvement of customer service.

(iv) Whether the advertising value of company-owned trucks is considered important. This is probably a less significant factor than is popularly believed because a manufacturer can blazon his advertising on the trucks or tractor-trailors of for-hire carriers (as is frequently done) if the carrier and the manufacturer have a contract involving big traffic movements. However, an example of

advertising as an important factor in private truck operations can be seen in Ontario. In that province, brewery companies which are prohibited by law from advertising their products in a conventional way have succeeded in bringing their names to public attention through attractive decoration and cleanliness of their vehicles, as well as maintaining notably high standards of road courtesy and safety. This is not to suggest, of course, that advertising has been the sole, or even the dominating concern of Ontario breweries in deciding to establish their own intercity motor carrier fleets.

Some manufacturers use a combination of their own vehicles and the services of for-hire carriers. Generally the company-owned vehicles are used for hauls where there is a return load of the company's own products or material, and thus the operation becomes economic. On the other hand, where there is no return load of company-owned material the outward shipment is consigned through a for-hire carrier whose licence will permit him to haul someone else's goods on the return journey.

Another factor in the combined use of private and for-hire vehicles is that by having a motor carrier fleet which is not quite adequate to meet peak demands there is a good average utilization of company-owned equipment.

*Provincial Regulation of Motor Carriers*

The responsibility for regulation of motor carriers is traditionally (and also by recent federal enactment) the responsibility of provincial authorities.

The provincial governments are, of course, entitled to credit for creating conditions under which motor carrier operations have flourished and brought general benefits to the community. Equally true, the provinces are open to criticism for some of the weaknesses of motor carrier operation resulting from laxity of regulation and enforcement, though some of this criticism must be tempered in light of uncertainties about jurisdiction which only recently have been resolved.

The principal regulatory items affecting motor carrier operations are:

(a) Control of entry into the transportation business.

(b) The rates to charge.

(c) The scale of licence fees payable by motor carriers.

(d) Permissible gross weights for various types of vehicles.

Items (a) and (b) affect only for-hire carriers. Items (c) and (d) affect all carriers.

Naturally there are other items of regulation, but these are either of an incidental nature or common to all forms of industry .

The references to for-hire motor carriers which follow do not include local cartage carriers.

The various policies on entry into the motor carrier business and rate regulation of motor carriers are:

## A — CONTROL OF ENTRY INTO THE "FOR-HIRE" MOTOR CARRIER BUSINESS

| | |
|---|---|
| Alberta | No control of entry. |
| British Columbia | At the discretion of the Public Utilities Commission, applicants may be required to furnish proof of public convenience and necessity before a licence is issued. |
| Manitoba | The Motor Carrier Board must be satisfied that public convenience will be promoted before an operating certificate is issued. |
| New Brunswick | Since Feb. 1, 1956, licence applicants have been required to show the Board of Commissioners of Public Utilities that public convenience will be promoted by the service proposed. |
| Newfoundland | No control of entry. |
| Nova Scotia | No control of entry. |
| Ontario | Applicant must satisfy the Ontario Highway Transport Board of public necessity and convenience of the service proposed before a licence is issued. |
| Prince Edward Island | No control of entry. |
| Quebec | Applicant must apply to the Transportation Board, which will base its decision on the "protection of the rights and interests of the public." |
| Saskatchewan | Applicant must appear before the Highway Traffic Board which will grant a licence if it finds that public business will be promoted by the proposed service. |

## B — RATES TO BE CHARGED

Alberta ..... No rate regulation.

British Columbia ..... Motor carriers file their intra-provincial rates with the Public Utilities Commission, and may not change them without the Commission's approval. Non-compliance with filed rates is an offence carrying, on conviction, the following penalties:

| | |
|---|---|
| First Offence ..... | $10.00 to $250.00 |
| Subsequent Offences . | 30.00 to 500.00 |

Additionally, where carriers charge other than filed rates, the P.U.C. has authority to suspend or cancel licences after the carriers concerned have had an opportunity of a hearing before the Board. However, an April, 1956, report from British Columbia states that up to that date neither fines nor suspensions had resulted from tariff violations. British Columbia does not control interprovincial or international rates.

Manitoba ..... Interprovincial rates are fixed by the Motor Carrier Board. Under the provincial Highway Traffic Act hauling of goods at rates other than those specified by the Board is an offence, and on conviction a fine ranging from $10.00 to $100.00 may be levied. In practice, however, the Board is reported to have called carriers before it only on receipt of complaints of overcharge. Where such overcharges have been proven the carrier has been ordered to refund the overcharge but, so far as is known, no penalty has been imposed. Manitoba exercises no control over interprovincial or international rates.

New Brunswick ..... Rate tariffs are filed by motor carriers, but there is no control of rates.

Newfoundland ..... No rate regulation.

Nova Scotia ..... No rate regulation.

Ontario .....No rate regulation.

Prince Edward Island ...No rate regulation.

Quebec .....Under the Quebec Transport Board Act, motor carriers must file all rates with the Transport Board and may not change them without the Board's approval. The Board also has authority to amend any rates in order to make them "fair and reasonable." It is an offence for a carrier or a shipper to charge or accept rates which differ from those on file with the Board, and on conviction the following fines may be levied:

| | |
|---|---|
| First Offence ..... | $10.00 to $ 25.00 |
| Second Offence ..... | $25.00 to $ 50.00 |
| Subsequent Offences.. | $50.00 to $100.00 |

In addition, where a rate in excess of the filed rate has been charged, the carrier must refund the difference. After three convictions for rate offences the Transport Board may recommend cancellation of registration permits for vehicles concerned in the offences.

Saskatchewan .....Intra-provincial rates are fixed by the Highway Traffic Board. Under the Saskatchewan Vehicles Act, failure to adhere to prescribed rates is an offence both on the part of carrier and shipper. On summary conviction fines may be levied as follows:

| | |
|---|---|
| First Offence ..... | $25.00 to $100.00 |
| Subsequent Offence .. | $50.00 to $250.00 |

Additionally the Highway Traffic Board may suspend a carrier's licence and subsequently amend or revoke his licence. However, the carrier must receive at least 10 days' notice of such revocation or amendment, and during that time may appear before the Board to state his case. Saskatchewan exercises no control over interprovincial or international rates.

It will be noted there is wide diversity in provincial policies on the two points of entry and rate control.

On the subject of permitted gross weights there is still some diversity between provinces, though over the past five years this has become less widespread. The following table shows provincial gross weights (as at August 20, 1956) for the most widely used type of intercity tractor-trailer combination, namely a truck-tractor with two axles coupled to a trailer with tandem axles:

| | |
|---|---|
| Alberta | 56,000 pounds |
| British Columbia | 56,000 pounds |
| Manitoba | 54,000 pounds |
| Newfoundland | No specific regulation |
| Nova Scotia | 48,000 pounds |
| Ontario | 58,000 pounds |
| Prince Edward Island | 50,000 pounds |
| Quebec | 50,000 pounds |
| Saskatchewan | 45,000 pounds |
| New Brunswick | 54,000 pounds |

With a few exceptions, which will be evident from the above table, the feeling of motor carriers seems to be that provincial governments have been reasonable and liberal with weight allowances and that regulations have been adjusted to conform with changing technical conditions.

### *The Penalties of Poor Co-ordination*

From the national point of view there have been two principal weaknesses in motor carrier regulation by the provinces. First is the absence, in some provinces, of any control of entry into the for-hire motor carrier business. Second is the poor enforcement of regulations, even in provinces where control of entry exists.

In the first case many trucking enterprises, founded more on optimism than business instinct, have sprung up and withered with remarkable speed. Yet before they have withered they have frequently had damaging effects upon motor carriers attempting to operate stable businesses based on sound economic principles. This process is continuing.

In the second case, even where control of entry into the trucking business in regulated, weak enforcement policies have permitted the "wildcatter" or "gypsy" operator to flourish, again to the detriment of the public interest through a lowering in standards of transportation service.

An outstanding example of how much harm can result from lax enforcement, or the absence of enforcement, is evidenced in the case of trans-border motor carrier operation.

For a generation, up to 1954, the federal government of Canada claimed it had legal right to regulate interprovincial and international truck traffic, although this right had never been exercised. Almost all the provincial governments disputed the federal view.

The issue was brought to a head in 1949 by the ruling of a New Brunswick court, which was subsequently appealed to the Supreme Court of Canada and later to the British Privy Council.

Eventually the rightness of the federal view was confirmed by the Privy Council, and the federal government then legally delegated its powers to provincial authorities under the Motor Vehicle Transport Act, 1954.

However, during the more than three years in which the dispute continued, there had been, in effect, a legal vacuum of authority. Many individuals took advantage of this so-called vacuum period to operate trucks and tractor-trailers without provincial permits, defying the provincial authorities who were unsure of their legal powers.

One effect of that period was to bring much disrepute to established motor carrier companies because many of the "vacuum" truckers had poor operating and business standards. This effect is present, to some extent, in the for-hire motor carrier industry today.

It is also true that despite the federal government's delegation of authority to regulate trans-border motor carriers, the provinces have not established a co-ordinated policy for employing that authority nor is there any continuous liaison between provinces on motor carrier matters.

This lack of co-ordination has given rise to much criticism of provincial governments by the intercity for-hire motor carrier industry. Indeed, there is a significant body of opinion within the industry which is strongly in favour of creation of a federal board to administer trans-border trucking, although it is admitted that the practical problems in separating the federal and provincial functions would be great. Here, as a matter of record, it must be stated that this is not the official view of Canadian Trucking Associations which has consistently endorced provincial control of all motor carrier functions.

But even if some form of national control is impractical (and it appears to be) there would seem to be urgent need, in the national interest, for co-ordination between provinces in the matter of motor carrier administration. Since the delegation of federal powers in 1954, one brief provincial conference on the subject has been held, but proved abortive.

However, if motor carrier operations are to continue to develop as a major transportation medium, some planning and co-ordination on a national scale is essential.

### *Motor Carriers — The Economic Length of Haul*

One of the oldest questions relating to the motor carrier industry is — what is the economic length of a motor truck haul?

Various attempts to answer this question have been made by motor carriers and competing transportation agencies. The motor carriers have

maintained that "the end of the road — wherever that may be" is the limit of trucking's economic function. Their competitors have denied this, sometimes claiming that only short or feeder hauling represents the proper economic sphere of motor carrier operations. Neither viewpoint is borne out by practical events.

Today, the greatest concentration of intercity motor truck activity is on routes between 20 and 600 miles in length. A great volume of motor carrier traffic also moves on routes up to 1,500 miles in length. But beyond that point there is considerable doubt as to whether or not line-haul motor carrier operations are profitable or practical.

A limiting factor in any regular motor carrier operations is the size of the vehicle used and its ability to carry a revenue producing load which will pay for operating and overhead costs and leave a margin for profit. This practical limitation is the reason why the tractor-trailer combination has replaced the so-called straight truck on almost all intercity hauls. The straight truck is incapable of carrying a sufficient payload to make anything greater than local movements profitable.

And even though modern design and engineering have increased the capacities of tractor-trailer combinations (to the point where a truck-trailer may now have in the neighborhood of 2,500 cubic feet of cargo space) the same limiting factor as with the straight truck would still appear to be present, though at what mileage point it occurs is difficult to decide. Perhaps only the process of natural selection in the rise and fall of business enterprises can settle that question, and at present this seems to be exactly what has happened.

In 1951, when for nine days the Canadian railways were strikebound, there was an urgent and desperate demand for transcontinental freight service. Although they could carry only a fraction of the transcontinental freight normally handled by the railways, a number of enterprising motor carriers (in most cases, small or individual operators) embarked on transcontinental motor carrier hauls and were able to obtain all the freight they could handle and at remunerative rates.

After the rail strike was settled the same motor carriers decided to stay in the transcontinental hauling business and later they were joined by others. Entry into the business was made easier because of the administrative vacuum period already described, during which provincial governments were unsure of their powers over this type of operation.

At the time these transcontinental motor carrier hauls were beginning, they were hailed as representing "a new era in the history of Canadian transportation" by many people who today would prefer to have their prediction forgotten.

Since that time almost all the original carriers have failed or gone out of business and in 1956 the volume of transcontinental motor carrier freight traffic moving over distances in excess of 1,500 miles has dwindled to a trickle. Household goods movers are still engaged in transcontinental business but theirs is a personalized type of hauling not subject to the economic laws of general freight movement.

Three major problems of ultra-long-haul motor carrier freight traffic have been:

(i) The lack of control over its vehicles by the operating company and, where control is exercised, the high cost of doing so.

(ii) The cost of duplicate licence fees, made necessary by the lack of licence reciprocity between most provinces and some U.S. states.

(iii) The high cost of insurance for this type of operation.

In addition the movement is so specialized, and profits so marginal, that a single tariff change by a competitive transportation agency can be (and has been) sufficient to mean business disaster for a motor carrier company.

Perhaps, with the completion of the trans-Canada highway, there may be some scope for motor carriers to haul specialized traffic on transcontinental routes. But unless and until there are major technical changes in tractor-trailer equipment and its capacity, a general freight movement of this type appears neither practical nor likely.

One possibility for the future, in which motor carriers and their competitors the railways may combine their individual technical advantages for the common good, is the "piggy-back" hauling of truck-trailers on flatcars. In the United States, for-hire motor carriers and railway companies have made mutual business arrangements using this system on a very large scale. In Canada, although the railways themselves have used the piggy-back system to haul their own truck-trailers, there has been no joint use of it by railways and for-hire motor carriers. Possibly, if some competitive differences of opinion could be reconciled the system might usefully be examined by both groups, and perhaps implemented — to their own and the national advantage.

*Appendix B*

# THE COST STRUCTURE OF THE TRANSPORTATION INDUSTRY

by W. G. Scott

By the cost structure of any form of transportation is meant the typical way in which its total costs are made up of fixed and variable costs. It is, of course, possible to make a number of other divisions but for an understanding of the economic basis of competitive rate making in the transportation industry the only other consideration necessary is common and joint costs.

### *Fixed and Variable Costs*

Fixed costs are those which do not vary in proportion to increases in transportation service. Variable costs are those which do increase in almost direct proportion with increased service.

In practice the problem in classifying these costs is complex because the distinction between fixed and variable costs is by no means clear-cut. For example, fixed costs can be broken down into the following two categories:

1) Costs incurred even when the transportation services are not in operation.
2) Costs incurred only when services are in operation, but which are independent of the scale of operation.

Another source of difficulty in the division of fixed and variable costs is the period of time under consideration. In the short-run period a large proportion of costs are fixed, since the extent to which transportation operations can be varied at short notice is relatively small. In the long run, however, the need to increase or decrease operations can be met by a complete turnover of all equipment in use if necessary. Existing equipment, for example, can be scrapped and replaced with a size more appropriate for the desired size of operation. Operating methods also can be frequently adapted to the new services required. Ultimately, the only fixed costs that continue in existence over an indefinite period of time are the financial obligations.

Heavy fixed costs are present in both pipeline and railway operations because of the large capital investment and the nature of the investment in their facilities. Initial capital costs of pipelines are very heavy, involving large finance charges. Railway rights-of-way, provided from their own resources, are responsible for the heavy fixed costs of the railway industry.

Right-of-way costs loom equally large in airline motor carrier and certain types of water operations but various levels of government assume the responsibility for these fixed costs out of public funds. Various types of taxes are levied on carriers for use of these facilities but they vary in almost direct proportion with the actual use made of the facilities and for this reason are variable and not fixed costs insofar as the carrier is concerned. In 1953 railways' right-of-way costs represented 21% of their total costs and airlines and motor carriers about 4% and 7% respectively. There are no tolls for the use of improved water channels.

Terminal facilities, where they are provided by the carrier, have also an element of fixed cost. Railways and motor carriers provide their own terminal facilities but airlines and water carriers make use of government airways, airports, port and harbour facilities. Charges for the use of these facilities are also in the nature of variable costs as they are paid for in accordance with the actual use made of them.

Equipment costs, or the costs of vessels, airplanes, trucks and trains are variable costs over the long run, although when considered from the short-run period they are in the nature of fixed costs. The degree of variability is closely associated with the useful economic life of each carrier's equipment. Motor carriers normally replace equipment in from three to five years, airlines from seven to ten years and railways, water carriers and pipelines over substantially longer periods and in that order.

A recent British study[1] of the costs of the various forms of transportation indicates the following division of total costs into track, terminal, vehicle and other:

| | Carrier | | | |
|---|---|---|---|---|
| | Air | Motor Carrier | Rail | Water |
| Cost Category | % | % | % | % |
| Track and Navigation ..... | — | 1 | 25 | — |
| Terminals ..... | 15 | 6 | 20 | 18 |
| Vehicles ..... | 68 | 85 | 50 | 63 |
| Other ..... | 17 | 8 | 5 | 19 |

The costs of Canadian carriers would probably differ from the above but they are reasonably indicative of the relative importance of the various broad categories of costs which influence fixed and variable costs in the transportation industry over the long-run period.

In summary, therefore, the nature of track, terminal and equipment costs of the carriers are such that pipelines and railways have a relatively much larger proportion of fixed costs than have air, water and highway carriers.

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[1] British Transport in the National Economy—Peter G. Masefield—Journal of the Institute of Transport, November 1955, p. 236.

The economic significance of fixed and variable costs is to be found in a carrier's rates, size of operations and economic mobility.

First and foremost is the type of rate structure a carrier might be expected to employ. Where the costs of a carrier have a greater proportion of fixed costs in relation to the costs of its competitors, the carrier is likely to make use of a wider range of differential charging than its competitors because the spread between its minimum profitable rate based on its out-of-pocket costs and its full costs is greater than is the case of its competitors. In other words heavy fixed costs should provide a relatively high degree of flexibility in adjusting rates to meet sudden changes in competitive conditions whereas a high proportion of variable costs should mean much less flexibility in rate making.

Heavy fixed costs also provide a strong inducement to expand operations over as many units of service as possible, which leads to large-scale organization. When on the other hand variable costs are large they serve as an automatic barrier to over-expansion and a tendency to small-scale organization.

This is clear, of course, from a consideration of the size of railways and motor carriers. Railway capital must be invested in large amounts relative to the traffic available. Railways turn over their capital about once in four years — Canadian railway capitalization is in excess of $4,000 million and gross transportation revenues slightly more than $1,000 million annually. Capital costs therefore form an important part of total costs of operation and additions to plant involve a substantial proportionate increase in capital investment, necessitating a considerable potential increase in traffic. Railroads, for example, have to make available large initial outlays for the construction of track and terminal facilities. When these are fully utilized, double-tracking and expansion of terminals entail difficult problems of market anticipation because the facilities have to be built well in advance of market opportunities. Meanwhile, the traffic which is available has to bear the overhead burden and possibly even some part of direct costs of the operation until the anticipated new traffic has developed.

Railroad investment, moreover, is specialized both as to function and markets. It is useful only in areas where it has been made and cannot easily follow the traffic if it shifts. The physical area served by the railroad constitutes the limits of its market and it cannot readily change these limits because of its immobility. This, of course, is not entirely true because of the smooth workings of interline rail arrangments as well as the use of motor vehicles in a co-ordinated operation.

Because of the extremely high cost of excessive competition between railways and the large amount of fixed costs stemming in part from the large initial capital investment involved, large-scale organization has characterized the railway industry.

Motor carrier organization, on the other hand, tends to be one of small-scale operations. The technical units are relatively small and may be very small. Operations may be started with a very small investment and expansion may be made with small increments of investment in direct and almost immediate response to the growth of traffic. Motor carriers, for example, normally turn over their capital two to three times a year or their annual gross revenues are two to three times their capital investment. This, of course, is largely due to not having to provide their own highway facilities, which is a heavy capital expense for railways.

Generally speaking, motor carrier facilities are not highly specialized as to function or to geographical areas and can be readily shifted between markets. Physically, the highways or routes are available to all who wish to use them. Alternative sources of supply can be made available readily and economic limitations or additions to facilities are very slight because small increases in traffic increase the need for additional equipment, at least within narrow limits, and these additions may be made in small units. Additional traffic can be carried, however, only by adding additional motive power because the power unit and the carrying capacity are in the same unit. New traffic normally requires additional equipment and therefore does not result in lower costs. This same economic characteristic is displayed by airlines and some water carriers. It is possible, for example, to start an airline or water carrier with a single piece of equipment and increase the size of the operation gradually in accordance with traffic expansion.

Transportation agencies such as pipelines and railways, because of the ratio between fixed and variable costs, enjoy decreasing costs with increased volume but motor carriers, airlines and water carriers experience constant or increasing costs with growth of traffic. This in turn is reflected in low out-of-pocket costs relative to total costs for pipelines and railways, but just the reverse for other carriers. At some point, of course, when operations reach full capacity additional service can only be provided at very high marginal costs. Airlines, motor carriers and water carriers display decreasing costs only within the capacity of their equipment, that is increased traffic which produces better loading of existing equipment results in decreased costs, but beyond this point new traffic will be handled at much the same cost or even at increased costs in cases where additional capacity provided cannot be fully utilized. The degree to which decreasing costs are experienced by these types of carriers varies moreover with the size of the unit of conveyance. For water carriers it would be considerably larger than for the other two.

Pipelines and railroads evidence strong economies of scale which accounts for their size, whereas airlines, motor carriers and water carriers display no strong economies or lack of economies due to scale. This is clear from the current structure of these industries. In aviation, for example, the size of a company may vary from three to several hundred airplanes

without any particular normal size. The same is true for motor and water carriers. Pipelines and railways, on the other hand, tend to be large enterprises even though small local lines survive for their own peculiar functions.

Finally the degree of fixed or variable costs in a carrier's cost structure determines the economic mobility of the carrier. Economic mobility of resources requires that they be readily transferable to uses other than those in which they are presently employed. This may be accomplished by the physical adaptation of facilities to new markets either by technological changes resulting in the production of new or different commodities and services, or by a geographic shift of plant or facilities to tap other markets. Ready transferability may also be achieved by disinvestment and a shift of the capital funds to other activities. If capital is invested in facilities that have a relatively short life, or in plants that can be shifted easily from one use to another or to other market areas, the utilization of resources soon responds readily to the demand for them.

Transportation agencies such as motor, water and air carriers, in which a relatively high proportion of costs are variable, possess a high degree of economic mobility. The fact that their costs are highly variable with output means that the resources utilized in operation are not committed to a particular use or market until they are worn out. It is the extreme degree of specialization of function, high proportion of fixed costs and geographic fixity of plant and market areas that can be served that make railroad transportation and pipelines economically immobile.

### *Common and Joint Costs*

The extent to which the cost structure of different carriers is influenced by common and joint costs will determine the degree of accuracy with which the full costs of individual shipments can be determined. It will also determine the extent to which differential charging is likely to characterize rates because common and joint costs, like fixed costs, must be recovered on the basis of the demand for the service rather than the cost of the service. With the exception of pipelines which handle a single commodity, the cost structures of all carriers are influenced by common and joint costs.

Common costs are present in all cases where costs are incurred for the provision of two or more services. For example, in airline operations ground staff normally handle freight, passenger and mail traffic interchangeably, the cost responsibility for any part of which is not possible of precise allocation to one or other of the types of traffic.

Allocation of these costs for rate making purposes, therefore, can only be made on some arbitrary basis and a wide range of results is possible depending upon the particular basis of allocation selected. The most that can be hoped for is to isolate the marginal or added cost for each service by observing the effect on total cost of any variation in the output of the individual service, the output of the other services remaining unchanged.

Another typical example of common costs is rail track which is used for a wide range of service.

Joint costs, on the other hand, are incurred when two or more services result from a single operation, the operation of one of necessity resulting in the operation of the other, though not necessarily in absolute proportion. Simple examples of these are the costs incurred in providing directional and seasonal transportation capacity. A motor carrier in providing a service between two points in one direction must make available capacity in the reverse direction regardless of whether the traffic flow is the same in each direction. Similarly in providing capacity for seasonal movements such as are characteristic of Canadian water carriers the same capacity is made available in the closed season but is not used unless it can be shifted to some other open route. This is very rarely possible, at least in domestic water carrier operations. In circumstances such as these only the round-trip total cost or the year-round cost for seasonal operations can be determined and rates must be such as to cover the total cost, the individual cost for the separate services being indeterminate. Thus the aggregate costs of a series of round-trip movements can be separated into their fixed and variable cost components, but the only costs which can be traced or attributed to the line-haul movement in any given direction are the added or incremental costs attributable to moving equipment in that direction. The line-haul cost of moving the equipment is a joint cost of the round-trip movement and cannot be attributed to the movement in either direction separately. It is for this reason that rates in the motor carrier industry are based on round-trip costs and low back haul rates are so prevalent.

Joint costs like common costs cannot be attributed either to individual traffic units or individual services. Joint costs differ from common costs in that the proportions of fixed and variable costs are freely variable, but in common costs the proportions are fixed or variable within definite limits. Joint costs also differ from fixed costs in that joint costs remain so regardless of the degree of utilization of the carrier's plant and irrespective of the size of the plant. In the case of fixed costs, however, when the point of full utilization is reached, that is when average costs are at their lowest point, the distinction between the marginal cost and the full cost disappears, the two being equal at this point.

Where various services with different elasticities of demand are provided under conditions of joint costs, differential charging is economically justified regardless of the degree to which the carrier's equipment is being utilized. This explains, for example, back hauling at low rates by trucking companies where the preponderance of traffic is in one direction, and long and short haul rate differentiation by rail carriers.

Furthermore there frequently tends to be an inverse relationship between rates of jointly produced services, which does not exist in the case of common and fixed costs. For example, as a carrier's traffic increases from A

to B requiring an increase in equipment it may be necessary to reduce rates from B to A to develop increased volume from B to A.

Fixed costs are frequently used interchangeably with joint costs, but this is a mistake because joint costs may be either variable or fixed depending upon the individual circumstance. Thus while the expense for the return movement of equipment might appear to be a fixed cost, the expense is variable to the extent that the number of round-trip movements can be controlled. Joint costs are those arising from the provision of a number of different services from the provision of a single service. Fixed costs are those which remain the same even when service is increased and which tend to decrease as traffic increases. Fixed costs and joint costs both give rise to justifiable differential charging but it is joint costs which are at the root of most rate anomalies. In other fields of business joint costs also cause price anomalies.

Dr. Ford K. Edwards, former Chief of the Cost Section of the Interstate Commerce Commission, in attempting to illustrate the analogy between differences in transportation rates on different commodities and the price of different cuts of meat states:[1]

> "The problem is analogous to that of the steer which the American Meat Institute has been widely portraying lately in national news weeklies.
>
> "If a steer costs $25.80 on the hoof (25.8¢ lb.), then why, it is asked, should porterhouse steak sell for $1.00, hamburger for 42¢ and hide and hair for something very much less. The problem is one of joint costs. The cost of the whole can furnish no meaningful figure either as to the cost of the parts or market prices on the parts.
>
> "The answer, of course, lies in the intensity of the consumer demand for each product. This and this alone provides the test of what it takes to attract each class of consumer and to clear the market of the respective products and by-products. A fully distributed statistical cost of 25.8¢ per pound applied "across the board" would receive scant attention in the market place by either buyers or sellers. The most that can be said for the hypothetical "full cost" figure is that it is a point of departure."

What then is the incidence of common and joint costs in the transportation industry? Pipeline operations are not affected by these costs because of the specialized movement of a homogeneous commodity without any back haul movement being involved. Water carriers because of the seasonal nature of their operations and the unbalanced directional traffic movements are affected by joint costs. Their effect on domestic operations is not noticeable because of the cost advantage water carriers enjoy from other technical characteristics. Because of the wide variety of services pro-

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[1] Transportation Costs, Value-of-Service and Freight Rates—Interstate Commerce Commission Practitioners' Journal—March 1954, p. 496.

vided and areas served railroads are substantially affected by joint costs. Owing to the extent of railway competition with other carriers, the effects of these costs are reflected in their rate structure. Motor carriers because of their less varied services and complete separation of passenger and freight services are affected to only a limited extent by common costs. Joint costs, however, are present in round-trip operations and give rise to back hauling at low rates. Airlines, all of which operate composite passenger, freight and mail services and experience severe directional and seasonal flows of traffic, are influenced by both joint and common costs and this influence is evidenced in their rate structure. Seasonal rates, directional rates for freight traffic and numerous other types of promotional rates are designed to promote the maximum utilization of capacity which is jointly produced under varying intensities of demand for airline services.

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Canadian Economic Growth and Development from 1939 to 1955 —
by J. M. Smith

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[1] This is one of a series of three studies on Canadian international economic relations prepared under the direction of S. S. Reisman.

# SCHEDULES

# AIR TRANSPORTATION

## DIRECT AND INDIRECT COSTS

| Items | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| DIRECT & INDIRECT COSTS — TOTAL | 2,332,000 | 6,478,000 | 56,001,000 | 112,343,000 | 140,737,000 |
| *Direct Costs — to Users of Transportation — Total* | 1,724,000 | 2,869,000 | 16,521,000 | 53,440,000 | 109,482,000 |
| *Domestic Public Carriers — Revenues Earned — Total* | 1,680,000 | 2,700,000 | 16,438,000 | 48,353,000 | 101,022,000 |
| Passengers | 1,680,000 | 2,700,000 | 9,248,000 | 34,574,000 | 69,321,000 |
| Freight | | | 1,373,000 | 4,228,000 | 15,895,000 |
| Mail | | | 5,556,000 | 8,261,000 | 10,089,000 |
| Miscellaneous | | | 261,000 | 1,290,000 | 5,717,000 |
| *User-Owned Transportation — Total* | 44,000 | 169,000 | 83,000 | 5,087,000 | 8,460,000 |
| *Indirect Costs — To General Public — Total* | 608,000 | 3,609,000 | 39,480,000 | 58,903,000 | 31,255,000 |
| *Federal Government Expenditures — Net* | 608,000 | 3,209,000 | 39,176,000 | 58,741,000 | 31,236,000 |
| Subsidy payments to carriers and municipalities | — | — | 1,956,000 | 4,415,000 | 215,000 |
| Operating costs — airways and airports | 60,000 | 583,000 | 5,302,000 | 12,553,000 | 15,413,000 |
| — meteorological | — | 197,000 | 1,185,000 | 2,275,000 | 3,168,000 |
| Ownership costs — capital expenditures (5-year average) | 360,000 | 2,060,000 | 30,480,000 | 42,184,000 | 15,000,000 |
| General administrative and miscellaneous | 188,000 | 380,000 | 586,000 | 1,775,000 | 3,284,000 |
| Less: revenue from facilities and services | — | 11,000 | 333,000 | 4,461,000 | 5,844,000 |
| *Provincial and Municipal Governments — Net* | — | 400,000 | 304,000 | 162,000 | 19,000 |
| Operating costs | — | — | — | 157,000 | 536,000 |
| Ownership costs — capital expenditures (5-year average) | — | 400,000 | 304,000 | 255,000 | 200,000 |
| Less: revenue from facilities and services | — | — | — | 154,000 | 607,000 |
| Subsidies for operating expenditures from federal government | — | — | — | 96,000 | 110,000 |

# AIR TRANSPORTATION
## FEDERAL AND MUNICIPAL INVESTMENT IN AIR SERVICES
*1923-1954*

| Year | Federal | | | | | | Municipal and Provincial | |
|---|---|---|---|---|---|---|---|---|
| | Civil[1] Aviation | Radio Aviation | Meteorological Services | Other[2] Investments (Airways) | Total Air Services | 5 Year[3] Moving Average | Total | 5 Year[3] Moving Average |
| | $ | $ | $ | $ | $ | $ | $ | $ |
| 1923 | — | — | — | — | — | — | — | |
| 1924 | — | — | — | — | — | — | — | |
| 1925 | — | — | — | — | — | — | — | |
| 1926 | — | — | — | — | — | — | — | |
| 1927 | 259,500 | — | — | — | 259,500 | — | — | |
| 1928 | 553,800 | — | — | — | 553,800 (Est.) | 360,000 | — | |
| 1929 | 762,000 | — | — | — | 762,000 | 367,000 | — | |
| 1930 | 259,800 | — | — | — | 259,800 | 315,100 | — | |
| 1931 | — | — | — | — | — | 204,400 | — | |
| 1932 | — | — | — | — | — | 52,000 | — | |
| 1933 | — | — | — | — | — | — | 315,000 | |
| 1934 | — | — | — | — | — | 834,000 | 315,000 | |
| 1935 | — | — | — | — | — | 1,307,700 | 314,900 | 390,200 |
| 1936 | 347,900 | — | 11,100 | 3,811,200 | 4,170,200 | 2,059,600 | 314,900 | 400,400 |
| 1937 | 1,125,100 | 868,600 | — | 374,800 | 2,368,500 | 2,900,100 | 691,200 | 358,860 |
| 1938 | 1,525,400 | 972,400 | — | 1,261,700 | 3,759,500 | 3,258,900 | 366,000 | 324,820 |
| 1939 | 1,696,800 | 1,140,400 | — | 1,364,900 | 4,202,100 | 2,747,400 | 107,300 | 281,820 |
| 1940 | 1,103,900 | 244,200 | — | 445,900 | 1,794,000 | 2,742,500 | 144,700 | 143,580 |
| 1941 | 1,009,000 | 343,500 | — | 260,000 | 1,612,500 | 2,565,700 | 99,900 | 70,380 |
| 1942 | 2,055,400 | 258,600 | 30,200 | — | 2,344,200 | 3,468,700 | — | 148,920 |
| 1943 | 2,223,500 | 379,000 | 73,300 | 200,000 | 2,875,800 | 5,214,500 | — | 219,980 |
| 1944 | 7,485,500 | 847,700 | 21,700 | 362,200 | 8,717,100 | 25,957,600 | 500,000 | 251,560 |
| 1945 | 7,228,600 | 670,900 | 75,200 | 2,548,100 | 10,522,800 | 30,479,800 | 500,000 | 304,300 |
| 1946 | 102,300,300 | 1,310,400 | 39,500 | 1,678,100 | 105,328,300 | 33,668,600 | 257,800 | 355,860 |
| 1947 | 22,495,700 | 2,325,300 | 133,900 | — | 24,954,900 | 62,305,000 | 263,700 | 307,420 |
| 1948 | 16,891,000 | 1,792,100 | 111,700 | 25,000 | 18,819,800 | 61,808,800 | 257,800 | 249,120 |
| 1949 | 145,977,300 | 5,664,900 | 159,300 | 97,300 | 151,898,800 | 42,184,100 | 257,800 | 255,300 |
| 1950 | 6,347,100 | 1,303,900 | 195,100 | 196,000 | 8,042,100 | 43,185,000 | 208,500 | 266,540 |
| 1951 | 5,130,600 | 1,788,900 | 177,000 | 108,300 | 7,204,800 | 41,598,800 | 288,700 | 264,320 |
| 1952 | 27,867,600 | 1,652,600 | 341,900 | 97,300 | 29,959,400 | 13,949,100 | 319,900 | 222,240 |
| 1953 | 8,144,100 | 2,149,000 | 453,700 | 142,200 | 10,889,000 (Est.) | 15,000,000 | 246,700 | (Est.) 200,000 |
| 1954 | 10,546,100 | 2,188,500 | 915,600 | — | 13,650,200 | — | 47,400 | |

(1) Includes transfers to War Assets Corporation. (2) Includes Grants to Municipal Airports; and Canadian Government Overseas Air Service. (3) Centred on third year.

Schedule 2

# HIGHWAY TRANSPORTATION

## DIRECT AND INDIRECT COSTS

| Item | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| HIGHWAY TRANSPORTATION — TOTAL | 796,988,000 | 936,869,000 | 1,492,970,000 | 2,935,273,000 | 5,594,144,000 |
| Direct cost — Total | 762,302,000 | 908,396,000 | 1,461,246,000 | 2,811,336,000 | 5,415,144,000 |
| Passenger cars | 336,913,000 | 406,671,000 | 491,777,000 | 927,570,000 | 1,965,014,000 |
| Taxis — operating cost | 33,410,000 | 34,361,000 | 59,911,000 | 83,575,000 | 143,990,000 |
| salaries | 17,815,000 | 14,915,000 | 34,153,000 | 58,240,000 | 132,753,000 |
| Buses — urban | 56,133,000 | 45,892,000 | 98,180,000 | 107,460,000 | 129,791,000 |
| intercity | 4,478,000 | 9,418,000 | 29,467,000 | 47,197,000 | 53,680,000 |
| school | 279,000 | 496,000 | 2,276,000 | 2,830,000 | 3,600,000 |
| Trucks — urban | 287,409,000 | 310,603,000 | 440,278,000 | 895,741,000 | 1,581,582,000 |
| farm | 11,489,000 | 22,744,000 | 65,303,000 | 113,637,000 | 184,648,000 |
| highway private | 10,866,000 | 46,717,000 | 167,893,000 | 399,809,000 | 825,921,000 |
| highway for-hire | 3,510,000 | 16,579,000 | 72,009,000 | 175,277,000 | 394,165,000 |
| Indirect Cost — Net | 34,686,000 | 28,473,000 | 31,723,000 | 123,937,000 | 179,000,000 |
| Highway Construction and Maintenance — Total | 67,006,000 | 88,095,000 | 139,667,000 | 324,590,000 | 487,000,000 |
| Federal | 2,410,000 | 7,556,000 | 3,976,000 | 12,776,000 | 27,000,000 |
| Provincial | 64,596,000 | 65,341,000 | 105,513,000 | 249,569,000 | 350,000,000 |
| Municipal | — | 15,198,000 | 30,178,000 | 62,245,000 | 110,000,000 |
| Less: motor vehicle revenue | 32,320,000 | 59,622,000 | 107,944,000 | 200,653,000 | 308,000,000 |
| Highway Construction and Maintenance | 68,466,000 | 86,526,000 | 130,884,000 | 317,237,000 | 484,630,000 |
| Construction (5-year average) | 46,236,000 | 56,876,000 | 65,016,000 | 182,174,000 | 290,000,000(1) |
| Maintenance (annual) | 22,230,000 | 26,386,000 | 61,601,000 | 122,815,000 | 177,116,000 |
| Administration (annual) | — | 3,264,000 | 4,267,000 | 12,248,000 | 17,514,000 |

(1) Estimated average figure for the years 1951 to 1955.

# HIGHWAY TRANSPORTATION

## MOTOR TRUCK REGISTRATIONS IN CANADA—BY PROVINCES[1]

| Province | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 |
|---|---|---|---|---|---|---|
| Newfoundland | — | — | — | 4,098 | 8,104 | 9,354 |
| Prince Edward Island | 443 | 852 | 2,043 | 3,071 | 5,424 | 5,724 |
| Nova Scotia | 4,538 | 8,338 | 15,049 | 25,565 | 33,904 | 36,762 |
| New Brunswick | 2,668 | 5,288 | 12,155 | 18,324 | 22,108 | 22,443 |
| Quebec | 21,747 | 30,075 | 52,403 | 91,493 | 136,341 | 139,966 |
| Ontario | 54,714 | 70,693 | 99,618 | 181,177 | 271,581 | 285,019 |
| Manitoba | 6,691 | 12,380 | 22,609 | 35,342 | 52,889 | 53,212 |
| Saskatchewan | 15,975 | 20,220 | 42,939 | 63,063 | 97,101 | 101,719 |
| Alberta | 8,919 | 17,310 | 36,262 | 62,405 | 106,822 | 111,894 |
| British Columbia | 13,835 | 19,524 | 32,185 | 58,850 | 83,521 | 88,637 |
| Yukon — N.W.T. | 48 | 118 | 343 | 1,555 | 2,315 | 2,121 |
| Total | 129,578 | 184,798 | 315,606 | 544,943 | 820,110 | 856,851 |

(1) As Reported in Dominion Bureau of Statistics publication, *The Motor Vehicle.*

# HIGHWAY TRANSPORTATION

## MOTOR TRUCK REGISTRATIONS IN CANADA—BY PROVINCES[1]

| Province | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 |
|---|---|---|---|---|---|---|
| Newfoundland | — | — | — | 3,900 | 7,700 | 8,900 |
| Prince Edward Island | 400 | 800 | 1,900 | 2,900 | 5,200 | 5,400 |
| Nova Scotia | 4,300 | 7,900 | 14,300 | 24,300 | 32,200 | 34,900 |
| New Brunswick | 2,500 | 5,000 | 11,500 | 17,400 | 21,000 | 21,300 |
| Quebec | 20,700 | 28,600 | 49,800 | 86,900 | 129,500 | 133,000 |
| Ontario | 52,000 | 67,200 | 94,700 | 172,100 | 258,100 | 270,800 |
| Manitoba | 6,400 | 11,800 | 21,500 | 33,600 | 50,200 | 50,600 |
| Saskatchewan | 15,200 | 19,200 | 40,800 | 59,900 | 92,200 | 96,600 |
| Alberta | 8,500 | 16,400 | 34,400 | 59,300 | 101,500 | 106,300 |
| British Columbia | 13,100 | 18,500 | 30,600 | 55,900 | 79,300 | 84,200 |
| Yukon—N.W.T. | — | 100 | 300 | 1,500 | 2,200 | 2,000 |
| Total | 123,100 | 175,500 | 299,800 | 517,700 | 779,100 | 814,000 |

(1) Reduced 5% from official registration figures to allow for growth and represent average effective registrations during year.

# HIGHWAY TRANSPORTATION

## NUMBER OF TRUCKS IN EACH WEIGHT CLASS, BY YEARS[1]

| Gross weight groups | Urban | | | | | | Farm | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 |
| 0 - 2½ tons | 66,900 | 69,100 | 72,200 | 122,800 | 174,100 | 179,200 | 16,700 | 31,200 | 66,100 | 95,200 | 123,200 | 121,800 |
| 2½- 5 tons | 15,600 | 21,900 | 31,700 | 61,900 | 100,900 | 107,600 | 10,300 | 20,900 | 49,800 | 76,400 | 105,400 | 105,900 |
| 5 - 7½ tons | 5,000 | 6,500 | 8,800 | 16,900 | 27,000 | 28,700 | 400 | 1,900 | 7,300 | 13,000 | 20,500 | 21,200 |
| 7½-10 tons | 2,800 | 4,500 | 7,000 | 14,100 | 23,400 | 25,100 | — | 800 | 4,100 | 7,700 | 12,700 | 13,200 |
| 10 -15 tons | 1,600 | 2,200 | 3,200 | 6,200 | 10,100 | 10,700 | — | — | 100 | 1,000 | 2,400 | 2,600 |
| over 15 tons | — | 200 | 1,400 | 3,400 | 6,500 | 7,200 | — | — | — | — | — | — |
| Total | 91,900 | 104,400 | 124,300 | 225,300 | 342,000 | 358,500 | 27,400 | 54,800 | 127,400 | 193,300 | 264,200 | 264,700 |

| Gross weight groups | Highway Private[2] | | | | | | Highway for-hire[3] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 |
| 0 - 2½ tons | 1,900 | 7,800 | 20,600 | 41,000 | 68,300 | 72,400 | 100 | 400 | 700 | 1,200 | 1,400 | 1,400 |
| 2½- 5 tons | 700 | 2,700 | 7,000 | 14,000 | 23,200 | 24,600 | 200 | 600 | 1,200 | 1,900 | 2,500 | 2,400 |
| 5 - 7½ tons | 200 | 800 | 2,000 | 4,100 | 6,800 | 7,200 | 200 | 700 | 1,600 | 2,800 | 4,000 | 4,000 |
| 7½-10 tons | 200 | 1,000 | 3,800 | 8,500 | 15,900 | 17,400 | 100 | 500 | 1,600 | 3,400 | 6,300 | 6,800 |
| 10 -15 tons | — | 500 | 2,400 | 5,800 | 11,800 | 13,000 | 100 | 400 | 1,700 | 3,900 | 7,400 | 8,200 |
| over 15 tons | — | 200 | 1,600 | 4,300 | 9,100 | 10,200 | — | 300 | 1,900 | 4,800 | 10,100 | 11,200 |
| Total | 3,000 | 13,000 | 37,400 | 77,700 | 135,100 | 144,800 | 700 | 2,900 | 8,700 | 18,000 | 31,700 | 34,000 |

(1) Based on figures obtained from D.B.S. publication, *The Motor Vehicle*.
(2) Reduced by 2½% to eliminate duplication of registrations in more than one province.
(3) Reduced by 7½% to eliminate duplication of registrations in more than one province.

# HIGHWAY TRANSPORTATION

## ESTIMATED AVERAGE ANNUAL TRUCK MILEAGE

| Vehicle Class and G.V.W. Group | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 |
|---|---|---|---|---|---|---|
| URBAN | | | | | | |
| 0 - 2½ tons | 5,550 | 6,150 | 6,820 | 7,120 | 7,420 | 7,500 |
| 2½- 5 tons | 5,620 | 6,230 | 6,920 | 7,220 | 7,520 | 7,600 |
| 5 - 7½ tons | 5,700 | 6,310 | 7,010 | 7,320 | 7,620 | 7,700 |
| 7½-10 tons | 6,660 | 7,380 | 8,190 | 8,550 | 8,910 | 9,000 |
| 10 -15 tons | 11,100 | 12,300 | 13,650 | 14,250 | 14,850 | 15,000 |
| over 15 tons | 9,620 | 10,660 | 11,830 | 12,350 | 12,870 | 13,000 |
| FARM | | | | | | |
| 0 - 2½ tons | 3,330 | 3,690 | 4,095 | 4,280 | 4,460 | 4,500 |
| 2½- 5 tons | 3,700 | 4,100 | 4,550 | 4,750 | 4,950 | 5,000 |
| 5 - 7½ tons | 4,070 | 4,510 | 5,005 | 5,220 | 5,440 | 5,500 |
| 7½-10 tons | 4,440 | 4,920 | 5,460 | 5,700 | 5,940 | 6,000 |
| 10 -15 tons | 5,180 | 5,740 | 6,370 | 6,650 | 6,930 | 7,000 |
| over 15 tons | 14,800 | 16,400 | 18,200 | 19,000 | 19,800 | 20,000 |
| HIGHWAY PRIVATE | | | | | | |
| 0 - 2½ tons | 7,400 | 8,200 | 9,100 | 9,500 | 9,900 | 10,000 |
| 2½- 5 tons | 8,880 | 9,840 | 10,920 | 11,400 | 11,880 | 12,000 |
| 5 - 7½ tons | 11,100 | 12,300 | 13,650 | 14,250 | 14,850 | 15,000 |
| 7½-10 tons | 14,060 | 15,580 | 17,290 | 18,050 | 18,810 | 19,000 |
| 10 -15 tons | 17,760 | 19,680 | 21,840 | 22,800 | 23,760 | 24,000 |
| over 15 tons | 25,900 | 28,700 | 31,850 | 33,250 | 34,650 | 35,000 |
| HIGHWAY FOR-HIRE | | | | | | |
| 0 - 2½ tons | 7,400 | 8,200 | 9,100 | 9,500 | 9,900 | 10,000 |
| 2½- 5 tons | 10,360 | 11,480 | 12,740 | 13,300 | 13,860 | 14,000 |
| 5 - 7½ tons | 14,060 | 15,580 | 17,290 | 18,050 | 18,810 | 19,000 |
| 7½-10 tons | 18,500 | 20,500 | 22,750 | 23,750 | 24,750 | 25,000 |
| 10 -15 tons | 23,680 | 26,240 | 29,100 | 30,400 | 31,680 | 32,000 |
| over 15 tons | 37,000 | 41,000 | 45,500 | 47,500 | 49,500 | 50,000 |

Note — Averages based on result of D.B.S. Motor Transport Survey, modified slightly to reflect the gradually increasing average mileage performed each year by all types of vehicles.

**Schedule 2D**

## HIGHWAY TRANSPORTATION

## AVERAGE ANNUAL OPERATING COST OF MOTOR TRUCKS

| Vehicle Class and G.V.W. Groups | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 |
|---|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ | $ |
| URBAN | | | | | | |
| 0 - 2½ tons | 2,965 | 2,775 | 3,219 | 3,573 | 4,109 | 4,120 |
| 2½- 5 tons | 3,222 | 3,020 | 3,508 | 3,895 | 4,481 | 4,495 |
| 5 - 7½ tons | 3,533 | 3,317 | 3,859 | 4,289 | 4,939 | 4,955 |
| 7½-10 tons | 4,229 | 3,978 | 4,637 | 5,158 | 5,944 | 5,965 |
| 10 -15 tons | 5,801 | 5,493 | 6,450 | 7,197 | 8,320 | 8,355 |
| over 15 tons | 6,150 | 5,832 | 6,860 | 7,660 | 8,861 | 8,900 |
| FARM | | | | | | |
| 0 - 2½ tons | 378 | 364 | 434 | 487 | 567 | 570 |
| 2½- 5 tons | 479 | 461 | 551 | 619 | 721 | 725 |
| 5 - 7½ tons | 604 | 583 | 700 | 788 | 919 | 925 |
| 7½-10 tons | — | 805 | 961 | 1,080 | 1,258 | 1,265 |
| 10 -15 tons | — | — | 1,265 | 1,423 | 1,660 | 1,670 |
| over 15 tons | — | — | — | — | — | — |
| HIGHWAY PRIVATE | | | | | | |
| 0 - 2½ tons | 3,347 | 3,134 | 3,634 | 4,033 | 4,637 | 4,650 |
| 2½- 5 tons | 3,760 | 3,529 | 4,106 | 4,562 | 5,254 | 5,270 |
| 5 - 7½ tons | 4,322 | 4,074 | 4,760 | 5,298 | 6,113 | 6,135 |
| 7½-10 tons | 5,055 | 4,783 | 5,613 | 6,261 | 7,235 | 7,265 |
| 10 -15 tons | — | 5,881 | 6,943 | 7,765 | 8,997 | 9,040 |
| over 15 tons | — | 8,805 | 10,487 | 11,770 | 13,687 | 13,765 |
| HIGHWAY FOR-HIRE | | | | | | |
| 0 - 2½ tons | 3,631 | 3,396 | 3,935 | 4,364 | 5,016 | 5,030 |
| 2½- 5 tons | 4,049 | 3,802 | 4,424 | 4,917 | 5,662 | 5,680 |
| 5 - 7½ tons | 4,823 | 4,551 | 5,323 | 5,929 | 6,844 | 6,870 |
| 7½-10 tons | 5,958 | 5,646 | 6,632 | 7,402 | 8,559 | 8,595 |
| 10 -15 tons | 7,760 | 7,396 | 8,747 | 9,788 | 11,349 | 11,405 |
| over 15 tons | — | 13,243 | 15,762 | 17,689 | 20,565 | 20,680 |

Schedule 2E

## HIGHWAY TRANSPORTATION

## AVERAGE OPERATING COST OF MOTOR TRUCKS PER MILE

| Vehicle Class and G.V.W. Group | 1928 | 1936 | 1945 | 1949 | 1953 | 1954 |
|---|---|---|---|---|---|---|
| | ¢ | ¢ | ¢ | ¢ | ¢ | ¢ |
| URBAN | | | | | | |
| 0 - 2½ tons | 53.4 | 45.1 | 47.2 | 50.2 | 55.4 | 54.9 |
| 2½- 5 tons | 57.3 | 48.5 | 50.7 | 53.9 | 59.6 | 59.1 |
| 5 - 7½ tons | 62.0 | 52.6 | 55.0 | 58.6 | 64.8 | 64.4 |
| 7½-10 tons | 63.5 | 53.9 | 56.6 | 60.3 | 66.7 | 66.3 |
| 10 -15 tons | 52.3 | 44.7 | 47.3 | 50.5 | 56.0 | 55.7 |
| over 15 tons | 63.9 | 54.7 | 58.0 | 62.0 | 68.9 | 68.5 |
| FARM | | | | | | |
| 0 - 2½ tons | 11.4 | 9.9 | 10.6 | 11.4 | 12.7 | 12.7 |
| 2½- 5 tons | 12.9 | 11.2 | 12.1 | 13.0 | 14.6 | 14.5 |
| 5 - 7½ tons | 14.8 | 12.9 | 14.0 | 15.1 | 16.9 | 16.8 |
| 7½-10 tons | — | 16.4 | 17.6 | 18.9 | 21.2 | 21.1 |
| 10 -15 tons | — | — | 19.9 | 21.4 | 24.0 | 23.9 |
| over 15 tons | — | — | — | — | — | — |
| HIGHWAY PRIVATE | | | | | | |
| 0 - 2½ tons | 45.2 | 38.2 | 39.9 | 42.5 | 46.8 | 46.5 |
| 2½- 5 tons | 42.3 | 35.9 | 37.6 | 40.0 | 44.2 | 43.9 |
| 5 - 7½ tons | 38.9 | 33.1 | 34.9 | 37.2 | 41.2 | 40.9 |
| 7½-10 tons | 36.0 | 30.7 | 32.5 | 34.7 | 38.5 | 38.2 |
| 10 -15 tons | — | 29.9 | 31.8 | 34.1 | 37.9 | 37.7 |
| over 15 tons | — | 30.7 | 32.9 | 35.4 | 39.5 | 39.3 |
| HIGHWAY FOR-HIRE | | | | | | |
| 0 - 2½ tons | 49.1 | 41.4 | 43.2 | 45.9 | 50.7 | 50.3 |
| 2½- 5 tons | 39.1 | 33.1 | 34.7 | 37.0 | 40.9 | 40.6 |
| 5 - 7½ tons | 34.3 | 29.2 | 30.8 | 32.8 | 36.4 | 36.2 |
| 7½-10 tons | 32.2 | 27.5 | 29.2 | 31.2 | 34.6 | 34.4 |
| 10 -15 tons | 32.8 | 28.2 | 30.1 | 32.2 | 35.8 | 35.6 |
| over 15 tons | — | 32.3 | 34.6 | 37.2 | 41.5 | 41.4 |

# HIGHWAY TRANSPORTATION

## ESTIMATED COST[1] OF OWNING AND OPERATING AN AUTOMOBILE IN CANADA—1954

| | First Year | | Second Year | | Third Year | | Fourth Year | | Fifth Year | | Sixth Year | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Amount | Cost per mile | Amount | Cost per mile | Amount | Cost per mile | Amount | Cost per mile | Amount | Cost per mile | Amount | Cost per mile |
| | $ | ¢ | $ | ¢ | $ | ¢ | $ | ¢ | $ | ¢ | $ | ¢ |
| COST (Excluding Taxes) | | | | | | | | | | | | |
| Depreciation | 675.00 | 8.438 | 400.00 | 5.000 | 300.00 | 3.750 | 250.00 | 3.125 | 200.00 | 2.500 | 175.00 | 2.188 |
| Repair & Maintenance | 32.56 | .407 | 42.32 | .529 | 69.60 | .870 | 98.56 | 1.232 | 99.68 | 1.246 | 160.72 | 2.009 |
| Tires & Tubes | 15.00 | .188 | 12.00 | .150 | 10.00 | .125 | 68.00 | .850 | 45.00 | .563 | 27.00 | .338 |
| Accessories | 16.50 | .206 | 16.50 | .206 | 16.50 | .206 | 16.50 | .206 | 16.50 | .206 | 16.50 | .206 |
| Gasoline | 148.50 | 1.856 | 148.50 | 1.856 | 148.50 | 1.856 | 148.50 | 1.856 | 148.50 | 1.856 | 148.50 | 1.856 |
| Oil | 17.60 | .220 | 17.60 | .220 | 17.60 | .220 | 19.80 | .248 | 22.00 | .275 | 17.60 | .220 |
| Insurance | 94.00 | 1.175 | 94.00 | 1.175 | 94.00 | 1.175 | 90.00 | 1.125 | 90.00 | 1.125 | 60.00 | .750 |
| Garage Tolls etc. | 100.00 | 1.250 | 100.00 | 1.250 | 100.00 | 1.250 | 100.00 | 1.250 | 100.00 | 1.250 | 100.00 | 1.250 |
| Finance Charges | 108.10 | 1.351 | 81.25 | 1.016 | 63.75 | .797 | 50.00 | .625 | 38.75 | .484 | 29.40 | .367 |
| TOTAL | 1,207.26 | 15.091 | 912.17 | 11.402 | 819.95 | 10.249 | 841.36 | 10.517 | 760.43 | 9.505 | 734.72 | 9.184 |
| TAXES AND FEES: | | | | | | | | | | | | |
| Gasoline Tax | 54.00 | .675 | 54.00 | .675 | 54.00 | .675 | 54.00 | .675 | 54.00 | .675 | 54.00 | .675 |
| Licence Fee | 16.00 | .200 | 16.00 | .200 | 16.00 | .200 | 16.00 | .200 | 16.00 | .200 | 16.00 | .200 |
| TOTAL | 70.00 | .875 | 70.00 | .875 | 70.00 | .875 | 70.00 | .875 | 70.00 | .875 | 70.00 | .875 |
| GRAND TOTAL | 1,277.26 | 15.966 | 982.17 | 12.277 | 889.95 | 11.124 | 911.36 | 11.392 | 830.43 | 10.380 | 804.72 | 10.059 |

(1) Based on an average life of 10 years and a utilization of 8,000 miles per year.

## HIGHWAY TRANSPORTATION

## ESTIMATED COST OF OWNING AND OPERATING AN AUTOMOBILE IN CANADA—1954

| | Seventh Year | | Eighth Year | | Ninth Year | | Tenth Year | | Ten-Year Period | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Amount | Cost per mile | Amount | Cost per mile | Amount | Cost per mile | Amount | Cost per mile | Amount | Cost per mile |
| | $ | ¢ | $ | ¢ | $ | ¢ | $ | ¢ | $ | ¢ |
| Costs (Excluding Taxes) | | | | | | | | | | |
| Depreciation | 150.00 | 1.875 | 125.00 | 1.563 | 100.00 | 1.250 | 75.00 | .938 | 2,450.00 | 3.063 |
| Repair & Maintenance | 147.44 | 1.843 | 126.24 | 1.578 | 72.88 | .911 | 39.68 | .496 | 889.68 | 1.112 |
| Tires & Tubes | 33.25 | .416 | 33.25 | .416 | 33.25 | .416 | 33.25 | .416 | 310.00 | .388 |
| Accessories | 14.25 | .178 | 14.25 | .178 | 14.25 | .178 | 14.25 | .178 | 156.00 | .195 |
| Gasoline | 148.50 | 1.856 | 148.50 | 1.856 | 148.50 | 1.856 | 148.50 | 1.856 | 1,485.00 | 1.856 |
| Oil | 17.60 | .220 | 17.60 | .220 | 19.80 | .248 | 22.00 | .275 | 189.20 | .237 |
| Insurance | 60.00 | .750 | 60.00 | .750 | 60.00 | .750 | 60.00 | .750 | 762.00 | .953 |
| Garage Tolls etc. | 100.00 | 1.250 | 100.00 | 1.250 | 100.00 | 1.250 | 100.00 | 1.250 | 1,000.00 | 1.250 |
| Finance Charges | 21.25 | .266 | 14.40 | .180 | 8.80 | .110 | 4.40 | .055 | 420.10 | .523 |
| TOTAL | 692.29 | 8.654 | 639.24 | 7.991 | 557.48 | 6.969 | 497.08 | 6.214 | 7,661.98 | 9.577 |
| TAXES AND FEES: | | | | | | | | | | |
| Gasoline Tax | 54.00 | .675 | 54.00 | .675 | 54.00 | .675 | 54.00 | .675 | 540.00 | .675 |
| Licence Tax | 16.00 | .200 | 16.00 | .200 | 16.00 | .200 | 16.00 | .200 | 160.00 | .200 |
| TOTAL | 70.00 | .875 | 70.00 | .875 | 70.00 | .875 | 70.00 | .875 | 700.00 | .875 |
| TOTAL ALL COSTS | 762.29 | 9.529 | 709.24 | 8.866 | 627.48 | 7.844 | 567.08 | 7.089 | 8,361.98 | 10.452 |

# ANNUAL EXPENDITURES ON RURAL ROADS AND URBAN STREETS AND USER REVENUES[1]

*1919-1953*

*(thousands of Dollars)*

| Year | Expenditures | | | | Expenditures | | | | Highway Revenues |
|---|---|---|---|---|---|---|---|---|---|
| | Construction | Maintenance | Administration | Total | Federal | Provincial | Municipal | Total | |
| | $ | $ | $ | $ | $ | $ | $ | $ | $ |
| 1919 | 13,394 | 6,251 | — | 19,645 | 2,038 | 17,607 | N/A | 19,645 | — |
| 1920 | 26,321 | 9,483 | — | 35,804 | 2,040 | 33,764 | " | 35,804 | — |
| 1921 | 39,216 | 12,914 | — | 52,130 | 2,053 | 50,077 | " | 52,130 | — |
| 1922 | 37,644 | 12,096 | — | 49,740 | 2,016 | 47,724 | " | 49,740 | 9,407 |
| 1923 | 42,203 | 13,796 | — | 55,999 | 2,062 | 53,937 | " | 55,999 | 11,427 |
| 1924 | 31,072 | 14,118 | — | 45,190 | 2,036 | 43,154 | " | 45,190 | 12,681 |
| 1925 | 31,537 | 15,272 | — | 46,809 | 2,070 | 44,739 | " | 46,809 | 17,508 |
| 1926 | 29,675 | 15,483 | — | 45,158 | 2,138 | 43,020 | " | 45,158 | 21,795 |
| 1927 | 35,844 | 17,579 | — | 53,423 | 2,165 | 51,258 | " | 53,423 | 24,535 |
| 1928 | 46,472 | 22,230 | — | 68,702 | 3,130 | 65,572 | " | 68,702 | 31,377 |
| 1929 | 51,564 | 23,391 | — | 74,955 | 601 | 74,354 | " | 74,955 | 41,076 |
| 1930 | 67,624 | 25,170 | — | 92,794 | 4,018 | 88,776 | " | 92,794 | 42,821 |
| 1931 | 65,107 | 25,911 | — | 91,018 | 12,245 | 78,773 | " | 91,018 | 42,231 |
| 1932 | 52,271 | 21,719 | — | 73,990 | 2,019 | 71,971 | " | 73,990 | 48,209 |
| 1933 | 29,652 | 15,074 | — | 44,726 | 2,429 | 42,297 | " | 44,726 | 47,044 |

(1) As shown in D.B.S. publications, "Highway and Motor Vehicle" and "Highway Statistics".

# ANNUAL EXPENDITURES ON RURAL ROADS AND URBAN STREETS AND USER REVENUES

*1919-1953*

*(thousands of dollars)*

| Year | Construction | Expenditures | | | Expenditures | | | | Highway Revenues |
|---|---|---|---|---|---|---|---|---|---|
| | | Maintenance | Administration | Total | Federal | Provincial | Municipal | Total | |
| | $ | $ | $ | $ | $ | $ | $ | $ | $ |
| 1934 | 46,144 | 19,015 | 1,866 | 67,025 | 9,823 | 45,424 | 11,778 | 67,025 | 50,622 |
| 1935 | 45,130 | 30,380 | 3,490 | 79,000 | 10,209 | 53,038 | 15,753 | 79,000 | 54,623 |
| 1936 | 40,855 | 26,386 | 3,264 | 70,505 | 5,749 | 51,039 | 13,717 | 70,505 | 61,026 |
| 1937 | 72,383 | 30,288 | 3,952 | 106,623 | 5,359 | 85,002 | 16,262 | 106,623 | 64,367 |
| 1938 | 79,867 | 33,054 | 4,406 | 117,327 | 6,643 | 92,204 | 18,480 | 117,327 | 67,475 |
| 1939 | 66,250 | 35,867 | 4,355 | 106,472 | 8,652 | 79,092 | 18,728 | 106,472 | 79,915 |
| 1940 | 66,264 | 43,707 | 5,765 | 115,736 | 1,986 | 96,419 | 17,331 | 115,736 | 85,479 |
| 1941 | 45,126 | 44,936 | 3,223 | 93,285 | 6,220 | 66,901 | 20,164 | 93,285 | 91,139 |
| 1942 | 31,920 | 40,798 | 2,952 | 75,670 | 7,517 | 51,142 | 17,011 | 75,670 | 85,323 |
| 1943 | 20,596 | 47,301 | 3,440 | 71,337 | 485 | 53,255 | 17,597 | 71,337 | 87,507 |
| 1944 | 35,313 | 48,058 | 3,980 | 87,351 | 3,975 | 62,293 | 21,083 | 87,351 | 88,700 |
| 1945 | 37,727 | 61,601 | 4,267 | 103,595 | 1,157 | 73,624 | 28,814 | 103,595 | 92,979 |
| 1946 | 90,442 | 71,544 | 7,083 | 169,069 | 6,300 | 126,772 | 35,997 | 169,069 | 113,471 |
| 1947 | 141,003 | 115,095 | 10,887 | 266,985 | 7,963 | 211,623 | 47,399 | 266,985 | 157,066 |
| 1948 | 172,901 | 119,335 | 14,143 | 306,379 | 6,448 | 251,452 | 48,479 | 306,379 | 175,618 |
| 1949 | 184,101 | 122,815 | 12,248 | 319,164 | 10,393 | 244,669 | 64,102 | 319,164 | 196,040 |
| 1950 | 183,562 | 132,056 | 15,413 | 331,031 | 17,170 | 247,027 | 66,834 | 331,031 | 222,332 |
| 1951 | 229,302 | 151,723 | 16,942 | 399,399* | 21,909 | 293,078 | 84,412 | 399,399* | 252,213 |
| 1952 | 284,861 | 174,758 | 15,825 | 475,591* | 25,239 | 356,029 | 94,323 | 475,591* | 278,004 |
| 1953 | 284,630 | 177,116 | 17,514 | 480,049* | 27,037 | 347,880 | 105,132 | 480,049* | 307,664 |

*Includes amounts not distributed between Construction, Maintenance and Administration.

**Schedule 3**

# PIPELINE TRANSPORTATION

## DIRECT COSTS 1950-1954

| Year | Total Capital | Operating Revenues | Operating Expenses | Net Revenues | Ton Miles | Average Revenues per Ton-Mile | Average Cost per Ton-Mile |
|---|---|---|---|---|---|---|---|
| | $ | $ | $ | $ | (000's) | Cents | Cents |
| 1950 | 107,848,783 | 4,005,600 | 2,866,000 | 1,139,600 | — | — | — |
| 1951 | 109,343,460 | 15,875,700 | 5,849,000 | 10,026,700 | 3,472,200 | 0.46 | 0.17 |
| 1952 | 126,867,214 | 20,064,200 | 9,906,000 | 10,158,200 | 4,689,000 | 0.43 | 0.21 |
| 1953 | 283,304,085 | 27,076,800 | 14,747,000 | 12,329,800 | 6,816,600 | 0.40 | 0.22 |
| 1954 | 333,423,000 | 41,722,000 | 21,616,000 | 20,106,000 | 9,057,800 | 0.46 | 0.24 |

Source: Pipeline Statistics — D.B.S.

**Schedule 4**

# RAILWAY TRANSPORTATION
## DIRECT AND INDIRECT COSTS

| Account | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| DIRECT AND INDIRECT COSTS — TOTAL | 554,546,000 | 378,751,000 | 739,455,000 | 926,313,000 | 1,182,920,000 |
| *Direct Costs to Users of Transportation — Net* | 545,564,000 | 318,092,000 | 730,833,000 | 843,255,000 | 1,122,330,000 |
| Domestic Public Carriers — Revenues Earned — Total | 548,787,000 | 322,593,000 | 753,697,000 | 869,169,000 | 1,164,763,000 |
| Passenger | 95,557,000 | 41,179,000 | 145,902,000 | 101,297,000 | 104,862,000 |
| Freight | 442,337,000 | 272,733,000 | 595,662,000 | 752,433,000 | 1,037,503,000 |
| Mail | 7,751,000 | 6,956,000 | 8,315,000 | 9,388,000 | 15,323,000 |
| Miscellaneous | 3,142,000 | 1,725,000 | 3,818,000 | 6,051,000 | 7,075,000 |
| Less: subsidy payments related to above items | 3,223,000 | 4,501,000 | 22,864,000 | 25,914,000 | 42,433,000 |
| *Indirect Costs to General Public — Total* | 8,982,000 | 60,659,000 | 8,622,000 | 83,058,000 | 60,590,000 |
| Federal Government Expenditures — Total | 6,249,000 | 57,100,000 | 4,440,000 | 75,258,000 | 52,468,000 |
| Payments to users — subsidies on traffic | 464,000 | 1,995,000 | 18,243,000 | 18,706,000 | 23,049,000 |
| Payments to railways — subsidies on traffic | 2,759,000 | 2,506,000 | 4,621,000 | 7,208,000 | 19,384,000 |
| — cash deficits or surplus | (1,953,000) | 44,806,000 | (23,545,000) | 43,229,000 | 3,935,000 |
| Ownership cost: capital expenditures | 4,589,000 | 4,589,000 | 4,589,000 | 4,589,000 | 4,589,000 |
| General and miscellaneous expenditures | 390,000 | 3,204,000 | 532,000 | 1,526,000 | 1,511,000 |
| Provincial Expenditures — Total | 2,733,000 | 3,559,000 | 4,182,000 | 7,800,000 | 8,122,000 |
| Ownership cost: capital expenditures | 2,733,000 | 3,559,000 | 4,182,000 | 7,800,000 | 8,122,000 |

# RAILWAY TRANSPORTATION

## FEDERAL GOVERNMENT CAPITAL INVESTMENT IN RAILWAYS

| Year | Canadian National Railways Investment | | Canadian[1] Government Railways | Hudson Bay Railway and Terminals | Ferries[2] and Terminals | Other Railways and Facilities | Steep Rock Railway and Dock | Total |
|---|---|---|---|---|---|---|---|---|
| | Loans and Advances | 4% Preferred Stock | | | | | | |
| | $ | $ | $ | $ | $ | $ | $ | $ |
| 1923.... | 7,943,457 | — | 204,028 | 234,975 | — | — | — | 8,382,460 |
| 1924.... | 5,321,303 | — | 46,756 | 298,623 | — | — | — | 5,666,682 |
| 1925.... | 10,000,000 | — | 1,339 | 133,933 | — | — | — | 10,135,272 |
| 1926.... | 9,219,497 | — | 4,438 | 2,808,549 | — | — | — | 12,032,484 |
| 1927.... | — | — | 72,371 | 2,674,225 | — | — | — | 2,746,596 |
| 1928.... | — | — | 178,591 | 3,389,084 | — | — | — | 3,567,675 |
| 1929.... | — | — | 84,243 | 5,357,692 | — | — | — | 5,441,935 |
| 1930.... | — | — | 2,508,877 | 1,557,298 | — | — | — | 4,066,175 |
| 1931.... | — | — | 1,091,296 | 920,499 | — | — | — | 2,011,795 |
| 1932.... | 8,077,338 | — | 110,207 | 505,496 | — | — | — | 8,693,041 |
| 1933.... | 8,228,101 | — | 18,000 | 390,386 | — | — | — | 8,636,487 |
| 1934.... | 10,747,974 | — | 70,000 | 306,826 | — | — | — | 11,124,800 |
| 1935.... | 14,364,873 | — | — | 279,779 | — | — | — | 14,644,652 |
| 1936.... | 7,411,736 | — | — | 199,062 | — | — | — | 7,610,798 |
| 1937.... | 34,469,140 CR | — | — | 71,454 | — | — | — | 34,397,686 CR |

# RAILWAY TRANSPORTATION

## FEDERAL GOVERNMENT CAPITAL INVESTMENT IN RAILWAYS

| Year | Canadian National Railways Investment | | Canadian[1] Government Railways | Hudson Bay Railway and Terminals | Ferries[2] and Terminals | Other Railways and Facilities | Steep Rock Railway and Dock | Total |
|---|---|---|---|---|---|---|---|---|
| | Loans and Advances | 4% Preferred Stock | | | | | | |
| | $ | $ | $ | $ | $ | $ | $ | $ |
| 1938.... | 8,864,171 | — | 1,528 | 20,388 | — | — | — | 8,886,087 |
| 1939.... | 28,650,517 | — | — | 22,569 | — | — | — | 28,673,086 |
| 1940.... | 109,896,964 | — | 750 | 6,070 | — | — | — | 109,903,784 |
| 1941.... | 254,105,193 | — | — | 4,518 | — | — | — | 254,109,711 |
| 1942.... | 167,602,574 | — | — | 37,555 | — | — | — | 167,640,129 |
| 1943.... | 31,732,315 | — | — | 59,882 | 632,500 | — | — | 32,424,697 |
| 1944.... | 106,634,917 | — | — | 6,457 | 623,181 | — | 1,754,581 | 109,019,136 |
| 1945.... | 67,369,926 | — | — | 17,816 | 2,295,424 | — | 778,318 | 70,461,484 |
| 1946.... | 20,520,640 CR | — | 633 | 12,774 | 2,640,742 | — | 380,818 | 17,485,673 CR |
| 1947.... | 71,717,367 | — | 109,160 | — | 3,700,320 | — | 43,668 | 75,570,515 |
| 1948.... | 2,817,267 | — | 25,000 | 4,705 | 3,156,983 | 52,192 | 197,397 | 6,253,544 |
| 1949.... | 10,442,878 CR | — | 2,045,974 | 176,193 | 1,354,802 | 258,258 | 54,403 | 6,553,248 CR |
| 1950.... | 15,618,028 | — | 869,611 | 29,157 | 268,696 | 3,940 | 51,538 | 16,840,970 |
| 1951.... | 134,497,874 | — | 370,014 | 39,599 | 734,059 | 124,217 | — | 135,765,763 |
| 1952.... | 117,920,709 | 23,401,272 | 1,086,543 | 90,278 | 2,862,103 | 1,527,412 | — | 146,888,317 |
| 1953.... | 38,763,498 CR | 20,671,394 | 151,210 | 114,510 | 6,219,684 | 6,145,773 | — | 5,460,927 CR |
| 1954.... | 90,612,232 CR | 19,171,898 | — | 122,156 | 6,609,765 | 12,210,232 | — | 52,498,181 CR |
| Total... | 1,003,933,713 | 63,244,564 | 9,050,569 | 19,892,508 | 31,098,259 | 20,322,024 | 3,260,723 | 1,150,802,360 |

Source: Official records of the Department of Transport.
(1) Includes Newfoundland Railway and Coastal Ships.
(2) Includes Prince Edward Island and Port aux Basques Ferries and Terminals.

# WATER TRANSPORTATION

## DIRECT AND INDIRECT COSTS

| Item | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| DIRECT AND INDIRECT COSTS — TOTAL | 97,194,000 | 74,102,000 | 244,937,000 | 267,412,000 | 323,158,000 |
| *Direct Cost to Users of Transportation — Net* | 63,257,000 | 53,516,000 | 227,707,000 | 216,141,000 | 252,987,000 |
| Domestic Public Carriers Revenues — Total | 63,924,000 | 54,345,000 | 229,604,000 | 220,174,000 | 259,507,000 |
| Passenger | — | — | — | 8,450,000 | 8,058,000 |
| Freight | 58,110,000 | 49,061,000 | 221,537,000 | 159,436,000 | 191,793,000 |
| Miscellaneous | — | — | — | 42,257,000 | 47,251,000 |
| C.N.R. and C.P.R. Coastal Services | 5,814,000 | 5,284,000 | 8,067,000 | 10,031,000 | 12,405,000 |
| Less: subsidy payments to public carriers | 667,000 | 829,000 | 1,897,000 | 4,033,000 | 6,520,000 |
| *Indirect Costs — Federal Government Expenditures — Net* | 33,937,000 | 20,586,000 | 17,230,000 | 51,271,000 | 70,171,000 |
| Harbours, Waterways and Marine Services Operating Costs — Total | 10,951,000 | 11,558,000 | 10,932,000 | 26,819,000 | 32,703,000 |
| Harbours | 2,308,000 | 4,330,000 | 2,794,000 | 10,743,000 | 7,845,000 |
| Canals | 2,416,000 | 2,357,000 | 2,820,000 | 6,198,000 | 8,996,000 |
| Marine Services | 6,227,000 | 4,871,000 | 5,318,000 | 9,878,000 | 15,862,000 |
| Ownership costs: capital expenditures (5-year average) | 23,695,000 | 7,544,000 | 5,742,000 | 20,197,000 | 30,000,000 |
| Subsidies and similar payments to carriers and users | 1,022,000 | 2,908,000 | 781,000 | 4,493,000 | 7,170,000 |
| Other Expenditures | — | 91,000 | 1,708,000 | 2,273,000 | 3,157,000 |
| Less: revenues from services and facilities | 1,731,000 | 1,515,000 | 1,933,000 | 2,511,000 | 2,859,000 |

Surplus (—)

# WATER TRANSPORTATION INVESTMENT EXPENDITURES DEPARTMENT OF TRANSPORT

*1923-1954*

| Year | Canals | Canal[1] Capital Improvements | Marine Service Steamers | River St. Lawrence Ship Channel Service | Public Works | | (3) | | | 5 year[4] Moving Average |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Dredging | Construction and Improvements[2] | Meteorological Services | Churchill Terminals | Total Investment | |
| | $ | $ | $ | $ | $ | $ | $ | $ | $ | $ |
| 1923..... | 6,748,056 | — | — | 681,095 | 1,979,531 | 3,729,975 | — | — | 13,138,657 | |
| 1924..... | 10,619,902 | — | — | 891,209 | 1,989,331 | 4,477,025 | — | — | 17,977,467 | |
| 1925..... | 12,027,880 | — | — | 1,596,754 | 2,207,848 | 4,065,296 | — | — | 19,897,778 | 18,402,237 |
| 1926..... | 13,846,730 | — | — | 1,583,946 | 1,849,495 | 2,096,968 | — | 16,905 | 19,394,044 | 20,611,733 |
| 1927..... | 13,763,129 | — | 169,968 | 1,917,792 | 2,807,506 | 2,064,205 | — | 880,643 | 21,603,243 | 21,707,269 |
| 1928..... | 13,220,424 | — | 404,443 | 1,894,111 | 2,974,493 | 2,922,185 | — | 2,770,478 | 24,186,134 | 23,695,483 |
| 1929..... | 9,385,725 | — | 1,718,356 | 2,588,145 | 3,084,014 | 5,639,773 | — | 1,039,133 | 23,455,146 | 23,683,660 |
| 1930..... | 10,307,327 | — | 633,904 | 2,941,965 | 4,099,876 | 9,273,387 | — | 2,582,390 | 29,838,849 | 21,915,193 |
| 1931..... | 3,904,292 | — | 54,930 | 6,110,352 | 2,416,664 | 2,525,084 | — | 4,323,607 | 19,334,929 | 18,503,032 |
| 1932..... | 3,122,267 | — | 210,829 | 5,922,358 | 1,455,930 | 927,060 | — | 1,122,461 | 12,760,905 | 15,637,285 |
| 1933..... | 1,976,593 | — | — | 3,220,307 | 1,075,343 | 688,069 | — | 165,018 | 7,125,330 | 11,661,677 |
| 1934..... | 466,523 | — | — | 5,865,032 | 808,151 | 1,861,506 | — | 125,201 | 9,126,413 | 9,274,516 |
| 1935..... | 547,570 | — | 29,955 | 5,511,053 | 1,039,860 | 2,711,129 | — | 121,240 | 9,960,807 | 7,871,828 |
| 1936..... | — | 389,369 | 135,172 | 3,279,523 | 2,100,572 | 1,377,107 | 700 | 116,681 | 7,399,124 | 7,543,767 |
| 1937..... | — | 207,997 | 91,071 | 2,698,256 | 2,076,241 | 673,900 | — | — | 5,747,465 | 8,126,257 |
| 1938..... | — | 107,336 | 720 | 2,896,742 | 2,138,069 | 342,160 | — | — | 5,485,027 | 6,869,002 |
| 1939..... | — | 248,685 | 624,800 | 3,727,586 | 1,619,651 | 5,797,741 | 20,400 | — | 12,038,863 | 6,122,741 |
| 1940..... | 165,361 | 296,173 | 97,003 | 1,995,864 | 738,795 | 338,634 | 42,700 | — | 3,674,530 | 5,688,635 |
| 1941..... | — | 16,030 | 102,104 | 2,106,516 | 918,822 | 477,652 | 46,700 | — | 3,667,824 | 5,158,472 |
| 1942..... | — | 52,395 | 109,003 | 1,701,441 | 1,222,870 | 344,797 | 146,424 | — | 3,576,930 | 3,422,172 |
| 1943..... | — | 35,136 | 233,941 | 939,881 | 869,350 | 523,610 | 232,296 | — | 2,834,214 | 3,423,650 |
| 1944..... | — | 123,416 | 600,527 | 910,817 | 1,083,043 | 497,056 | 142,504 | — | 3,357,363 | 4,082,308 |
| 1945..... | — | 76,942 | 9,000 | 948,701 | 1,523,137 | 991,117 | 133,024 | — | 3,681,921 | 5,742,233 |
| 1946..... | — | 85,702 | 143,516 | 970,534 | 2,105,115 | 3,651,509 | 4,740 | — | 6,961,116 | 8,570,947 |
| 1947..... | 61,635 | 38,477 | 545,045 | 2,489,584 | 3,215,362 | 5,448,981 | 77,468 | — | 11,876,552 | 13,029,681 |
| 1948..... | — | 238,348 | 797,297 | 3,674,759 | 4,208,224 | 7,873,152 | 186,004 | — | 16,977,784 | 17,171,242 |
| 1949..... | — | 332,583 | 4,126,299 | 3,532,365 | 5,348,630 | 12,089,640 | 221,516 | — | 25,651,033 | 20,197,287 |
| 1950..... | — | 1,133,791 | 2,682,314 | 3,612,568 | 6,202,956 | 10,526,986 | 231,112 | — | 24,389,727 | 23,237,393 |
| 1951..... | — | 2,349,458 | 2,862,304 | 2,013,408 | 5,624,545 | 9,055,786 | 185,840 | — | 22,091,341 | 26,877,716 |
| 1952..... | — | 2,635,289 | 4,797,747 | 3,133,302 | 5,435,334 | 10,823,979 | 251,428 | — | 27,077,079 | 27,925,888 |
| 1953..... | — | 3,285,344 | 1,564,863 | 4,399,988 | 6,747,482 | 18,746,780 | 434,944 | — | 35,179,401 | (Est) 30,000,000 |
| 1954..... | — | 2,043,364 | 1,999,177 | 4,029,361 | 6,977,332 | 15,232,280 | 610,379 | — | 30,891,893 | |

(1) From Improvement Votes 1935-1953 — Department of Transport, Financial Services.
(2) This covers all harbours not the responsibility of the National Harbours Board.
(3) Includes Marine Radio from Air Services.
(4) Centred on third year.

Schedule 6

## SUMMARY OF DIRECT AND INDIRECT COST OF TRANSPORTATION

| Transportation Media | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| DIRECT COSTS — TOTAL | 1,372,847,000 | 1,282,873,000 | 2,436,308,000 | 3,924,172,000 | 6,927,020,000 |
| Airways | 1,724,000 | 2,869,000 | 16,521,000 | 53,440,000 | 109,482,000 |
| Highways | 762,302,000 | 908,396,000 | 1,461,247,000 | 2,811,336,000 | 5,415,144,000 |
| Pipelines | — | — | — | — | 27,077,000 |
| Railways | 545,564,000 | 318,092,000 | 730,833,000 | 843,255,000 | 1,122,330,000 |
| Waterways | 63,257,000 | 53,516,000 | 227,707,000 | 216,141,000 | 252,987,000 |
| INDIRECT COSTS — TOTAL | 78,213,000 | 113,327,000 | 97,055,000 | 317,169,000 | 341,016,000 |
| Airways | 608,000 | 3,609,000 | 39,480,000 | 58,903,000 | 31,255,000 |
| Highways | 34,686,000 | 28,473,000 | 31,723,000 | 123,937,000 | 179,000,000 |
| Pipelines | — | — | — | — | — |
| Railways | 8,982,000 | 60,659,000 | 8,622,000 | 83,058,000 | 60,590,000 |
| Waterways | 33,937,000 | 20,586,000 | 17,230,000 | 51,271,000 | 70,171,000 |

Schedule 6A

# RATIO OF DIRECT AND INDIRECT COSTS TO TOTAL COSTS OF TRANSPORTATION

| Transportation Media | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | % | % | % | % | % |
| TOTAL COST OF TRANSPORTATION | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| DIRECT COSTS — TOTAL | 94.6 | 91.9 | 96.1 | 92.6 | 95.3 |
| Airways | .1 | .2 | .7 | 1.3 | 1.5 |
| Highways | 52.5 | 65.1 | 57.7 | 66.3 | 74.5 |
| Pipelines | — | — | — | — | .4 |
| Railways | 37.6 | 22.8 | 28.8 | 19.9 | 15.4 |
| Waterways | 4.4 | 3.8 | 8.9 | 5.1 | 3.5 |
| INDIRECT COSTS — TOTAL | 5.4 | 8.1 | 3.9 | 7.4 | 4.7 |
| Airways | — | .3 | 1.6 | 1.4 | .4 |
| Highways | 2.4 | 2.0 | 1.3 | 2.9 | 2.5 |
| Pipelines | — | — | — | — | — |
| Railways | .7 | 4.3 | .3 | 1.9 | .8 |
| Waterways | 2.3 | 1.5 | .7 | 1.2 | 1.0 |

Schedule 6B

# RATIO OF TYPE OF TRANSPORTATION TO DIRECT AND INDIRECT COSTS

| Transportation Media | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| DIRECT COSTS — TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Airways | .1 | .2 | .7 | 1.3 | 1.6 |
| Highways | 55.5 | 70.8 | 60.0 | 71.6 | 78.2 |
| Pipelines | — | — | — | — | .4 |
| Railways | 39.8 | 24.8 | 30.0 | 21.5 | 16.2 |
| Waterways | 4.6 | 4.2 | 9.3 | 5.6 | 3.6 |
| INDIRECT COSTS — TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Airways | .8 | 3.2 | 40.7 | 18.6 | 9.1 |
| Highways | 44.3 | 25.1 | 32.7 | 39.0 | 52.4 |
| Pipelines | — | — | — | — | — |
| Railways | 11.5 | 53.6 | 8.9 | 26.2 | 18.0 |
| Waterways | 43.4 | 18.1 | 17.7 | 16.2 | 20.5 |

**Schedule 6C**

## ADJUSTED DOLLAR VALUE OF DIRECT AND INDIRECT COSTS OF TRANSPORTATION

| Transportation | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| Index | 75.0 | 61.1 | 75.0 | 100.0 | 115.5 |
| DIRECT COSTS — TOTAL | $1,830,464,000 | $2,099,629,000 | $3,248,410,000 | $3,924,172,000 | $5,997,419,000 |
| Airways | 2,299,000 | 4,696,000 | 22,028,000 | 53,440,000 | 94,790,000 |
| Highways | 1,016,403,000 | 1,486,736,000 | 1,948,329,000 | 2,811,336,000 | 4,688,436,000 |
| Pipelines | — | — | — | — | 23,443,000 |
| Railways | 727,419,000 | 520,609,000 | 974,444,000 | 843,255,000 | 971,714,000 |
| Waterways | 84,343,000 | 87,588,000 | 303,609,000 | 216,141,000 | 219,036,000 |
| INDIRECT COSTS — TOTAL | $ 104,284,000 | $ 185,478,000 | $ 129,406,000 | $ 317,169,000 | $ 295,252,000 |
| Airways | 811,000 | 5,907,000 | 52,640,000 | 58,903,000 | 27,061,000 |
| Highways | 46,248,000 | 46,601,000 | 42,297,000 | 123,937,000 | 154,978,000 |
| Pipelines | — | — | — | — | — |
| Railways | 11,976,000 | 99,278,000 | 11,496,000 | 83,058,000 | 52,459,000 |
| Waterways | 45,249,000 | 33,692,000 | 22,973,000 | 51,271,000 | 60,754,000 |

Adjusted by Cost of Living Index (Base 1949=100)

**Schedule 6D**

# PER CAPITA
# DIRECT AND INDIRECT COST OF TRANSPORTATION
# (ADJUSTED DOLLAR VALUES)

| Transportation Media | 1928 | 1936 | 1945 | 1949 | 1953 |
|---|---|---|---|---|---|
| | $ | $ | $ | $ | $ |
| DIRECT COSTS — TOTAL | 186.12 | 191.75 | 269.09 | 291.82 | 405.75 |
| Airways | .23 | .43 | 1.82 | 3.97 | 6.41 |
| Highways | 103.35 | 135.77 | 161.39 | 209.07 | 317.19 |
| Pipelines | — | — | — | — | 1.59 |
| Railways | 73.96 | 47.54 | 80.72 | 62.71 | 65.74 |
| Waterways | 8.58 | 8.00 | 25.15 | 16.07 | 14.82 |
| INDIRECT COSTS — TOTAL | 10.60 | 16.94 | 10.72 | 23.59 | 19.97 |
| Airways | .08 | .54 | 4.37 | 4.38 | 1.83 |
| Highways | 4.70 | 4.25 | 3.50 | 9.22 | 10.48 |
| Pipelines | — | — | — | — | — |
| Railways | 1.21 | 9.07 | .95 | 6.18 | 3.55 |
| Waterways | 4.62 | 3.08 | 1.90 | 3.81 | 4.11 |

Schedule 7

# CANADIAN RURAL ROADS AND URBAN STREET MILEAGES

*1928 - 1953*

| Year | Total Surfaced | Other | Total Mileages |
|---|---|---|---|
| 1928 | 64,121 | 317,858 | 381,979 |
| 1929 | 72,143 | 317,917 | 390,060 |
| 1930 | 80,498 | 313,875 | 394,373 |
| 1931 | 87,366 | 290,729 | 378,094 |
| 1932 | 91,312 | 307,008 | 398,320 |
| 1933 | 94,563 | 314,405 | 409,124 |
| 1934 | 93,642 | 315,627 | 409,269 |
| 1935 | 104,409 | 317,359 | 421,969 |
| 1936 | 107,959 | 314,152 | 422,111 |
| 1937 | 121,582 | 448,869 | 570,451 |
| 1938 | 119,276 | 389,340 | 508,615 |
| 1939 | 123,158 | 387,512 | 510,669 |
| 1940 | 125,221 | 448,054 | 573,276 |
| 1941 | 130,159 | 444,582 | 574,741 |
| 1942 | 132,177 | 445,885 | 578,061 |
| 1943 | 134,711 | 431,746 | 566,457 |
| 1944 | 137,335 | 430,656 | 567,991 |
| 1945 | 141,382 | 424,877 | 566,260 |
| 1946 | 150,080 | 417,209 | 567,289 |
| 1947 | 156,105 | 413,082 | 569,186 |
| 1948 | 160,975 | 410,123 | 571,098 |
| 1949 | 172,533 | 403,852 | 576,385 |
| 1950 | 180,420 | 401,197 | 581,617 |
| 1951 | 186,723 | 340,010(1) | 526,733 |
| 1952 | 193,474 | 334,510(1) | 527,984 |
| 1953 | 203,828 | 329,832(1) | 533,660 |

Sources: D.B.S. publications, "Highway Statistics" and "The Highway and the Motor Vehicle".

(1) Excludes 56,896 miles of unimproved road allowance not in use in Saskatchewan.

**Schedule 8**

## RAILWAY RIGHT-OF-WAY EXPENDITURES AS A PERCENTAGE OF TOTAL OPERATING EXPENSES[1]

| Operating Expenses | $ (000) |
|---|---|
| Maintenance and Depreciation of Equipment | 249,832 |
| Traffic | 22,346 |
| Transportation | 512,618 |
| Miscellaneous | 14,996 |
| General[2] | 66,986 |
| Railway Tax Accruals[3] | 17,932 |
| Total | 884,710 |
| Maintenance of Way and Structures[4] | 228,609 |
| Total Operating Expenses | $1,113,319 |
| Maintenance of Way as a % of Total Operating Expenses | 20.5% |

(1) Canadian National and Canadian Pacific Operations — 1953

(2) Includes equipment rents and joint facility rents.

(3) Excludes that portion of taxes estimated to be applicable to right-of-way.

(4) Includes taxes estimated to be applicable to right-of-way.

Source: "Railway Transport", D.B.S.
Annual Reports — C.N.R. - C.P.R.

Schedule 9

## OPERATING EXPENSES
## CANADIAN MOTOR FREIGHT CARRIERS — GROUP 1(1)

*1953*

*Number of Carriers — 951*

| DIRECT OPERATING EXPENSES | $ (000) |
|---|---|
| Maintenance | 26,205 |
| Wages and salaries | 43,483 |
| Fuel, oil and other transportation | 21,015 |
| Insurance and safety | 7,366 |
| Depreciation | 15,370 |
| Rents — net | 3,616 |
| Other | 30,103 |
| Sub-total | 147,158 |
| RIGHT-OF-WAY EXPENSES | |
| Operating taxes and licences | 10,252 |
| Bridge, ferry and tunnel tolls | 664 |
| Sub-total | 10,916 |
| Total Operating Expenses | 158,074 |
| Right-of-way as a % of Total Operating Expenses | 6.9% |

1) For-hire Carrier Class — Group. I.
Annual Gross Revenues $20,000 and over.

Source: D.B.S. Motor Carriers Freight-Passenger, 1953.

**Schedule 10**

## COMPARISON OF HIGHWAY TAX PAYMENTS PER GROSS TON-MILE FOR A SELECTED GROUP OF VEHICLES IN INTRAPROVINCIAL OPERATIONS

| Vehicle Type | Estimated Gross Weight (lbs) | NFLD. ¢ | P.E.I. ¢ | N.S. ¢ | N.B. ¢ | QUE. ¢ | ONT. ¢ | MAN. ¢ | SASK. ¢ | ALTA. ¢ | B.C. ¢ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Passenger car | 3,500 | .664 | .636 | .698 | .643 | .596 | .450 | .407 | .457 | .493 | .482 |
| Pick-up truck | 5,000 | .656 | .571 | .638 | .581 | .681 | .509 | .440 | .469 | .576 | .512 |
| Light truck | 10,000 | .452 | .442 | .478 | .447 | .406 | .448 | .399 | .486 | .377 | .369 |
| Medium truck | 30,000 | .554 | .414 | .477 | .428 | .394 | .428 | .396 | .434 | .321 | .330 |
| Tractor trailer | 40,000 | — | .169 | .168 | .169 | .144 | .135 | .129 | .142 | .134 | .109 |
| Tractor trailer(1) | | — | .163 | .161 | .159 | .129 | .130 | .134 | .145 | .130 | .100 |
| Tractor trailer (diesel)(1) | | — | .124 | .119 | .122 | .098 | .107 | .111 | .115 | .106 | .077 |

(1) Based on maximum gross weights for each province.
Source: D.B.S. Provincial Motor Vehicle Acts.

# INDEX OF AUTOMOBILE REGISTRATIONS AND SELECTED NATIONAL ECONOMIC TRENDS

## 1928 - 1953

*(1939 = 100)*

| Year | Automobile Registrations | Index | Gross National Product Constant (1935-39) Dollars | Index | Population | Index |
|---|---|---|---|---|---|---|
| | | | (000,000) | | (000) | |
| 1928 | 930,619 | 78.2 | 5,330 | 94.1 | 9,835 | 87.3 |
| 1929 | 1,022,654 | 85.9 | 5,337 | 94.2 | 10,029 | 89.0 |
| 1930 | 1,055,514 | 88.7 | 5,127 | 90.5 | 10,208 | 90.6 |
| 1931 | 1,023,923 | 86.0 | 4,475 | 79.0 | 10,376 | 92.1 |
| 1932 | 945,073 | 79.4 | 4,096 | 72.3 | 10,510 | 93.3 |
| 1933 | 917,008 | 77.1 | 3,772 | 66.6 | 10,633 | 94.4 |
| 1934 | 952,427 | 80.0 | 4,208 | 74.3 | 10,741 | 95.3 |
| 1935 | 989,744 | 83.2 | 4,530 | 80.0 | 10,845 | 96.2 |
| 1936 | 1,041,529 | 87.5 | 4,738 | 83.6 | 10,950 | 97.2 |
| 1937 | 1,103,012 | 92.7 | 5,201 | 91.8 | 11,045 | 98.0 |
| 1938 | 1,159,604 | 97.4 | 5,246 | 92.6 | 11,152 | 99.0 |
| 1939 | 1,190,021 | 100.0 | 5,664 | 100.0 | 11,267 | 100.0 |
| 1940 | 1,234,637 | 103.8 | 6,487 | 114.5 | 11,381 | 101.0 |
| 1941 | 1,279,536 | 107.5 | 7,481 | 132.1 | 11,507 | 102.1 |
| 1942 | 1,216,950 | 102.3 | 8,941 | 157.9 | 11,654 | 103.4 |
| 1943 | 1,193,847 | 100.3 | 9,374 | 165.5 | 11,795 | 104.7 |
| 1944 | 1,177,558 | 99.0 | 9,721 | 171.6 | 11,946 | 106.0 |
| 1945 | 1,160,058 | 97.5 | 9,315 | 164.5 | 12,072 | 107.1 |
| 1946 | 1,234,006 | 103.7 | 9,045 | 159.7 | 12,292 | 109.1 |
| 1947 | 1,370,173 | 115.1 | 9,165 | 161.8 | 12,551 | 111.4 |
| 1948 | 1,496,784 | 125.8 | 9,438 | 166.6 | 12,823 | 113.8 |
| 1949 | 1,663,330 | 139.8 | 9,722 | 171.6 | 13,102 | 116.3 |
| 1950(1) | 1,907,169 | 160.3 | 10,330 | 182.4 | 13,712 | 121.7 |
| 1951 | 2,097,594 | 176.3 | 10,935 | 193.1 | 14,009 | 124.3 |
| 1952 | 2,296,435 | 193.0 | 11,677 | 206.2 | 14,430 | 128.1 |
| 1953 | 2,513,754 | 211.2 | 12,134 | 214.2 | 14,781 | 131.2 |

(1) Newfoundland included from 1950.

Sources: Motor Vehicle — D.B.S.
Canadian Statistical Review — 1955 Supplement D.B.S.

Edmond Cloutier, C.M.G., O.A., D.S.P.
Queen's Printer and Controller of Stationery
Ottawa, 1957